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AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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Typical Report Citation and Abstract

❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10’ to 50’, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65’ swept forebody serrations tended to roll together, while vortices from 40’ swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

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2. Title
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7. Abstract
8. Abstract Author
9. Subject Terms

AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 372)

APRIL 17, 1998

01
AERONAUTICS

19980017994 NASA Ames Research Center, Moffett Field, CA USA

Optimal Trajectories for the Helicopter in One-Engine-Inoperative Terminal-Area Operations

Zhao, Yiyuan, NASA Ames Research Center, USA; Chen, Robert T. N., Minnesota Univ., USA; May 1996; 34p; In English

Contract(s)/Grant(s): RTOP 505-59-36

Report No.(s): NASA/TM-96-110400; A-961613; NAS 1.15:110400; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents a summary of a series of recent analytical studies conducted to investigate One-Engine-Inoperative (OEI) optimal control strategies and the associated optimal trajectories for a twin engine helicopter in Category-A terminal-area operations. These studies also examine the associated heliport size requirements and the maximum gross weight capability of the helicopter. Using an eight states, two controls, augmented point-mass model representative of the study helicopter, Continued TakeOff (CTO), Rejected TakeOff (RTO), Balked Landing (BL), and Continued Landing (CL) are investigated for both Vertical-TakeOff-and-Landing (VTOL) and Short-TakeOff-and-Landing (STOL) terminal-area operations. The formulation of the nonlinear optimal control problems with considerations for realistic constraints, solution methods for the two-point boundary-value problem, a new real-time generation method for the optimal OEI trajectories, and the main results of this series of trajectory optimization studies are presented. In particular, a new balanced- weight concept for determining the takeoff decision point for VTOL Category-A operations is proposed, extending the balanced-field length concept used for STOL operations.

Author

Trajectory Optimization; Vertical Takeoff; Helicopter Engines; Terminal Facilities; Vertical Takeoff Aircraft

19980018330 Air Force Materiel Command, Productivity, Reliability, Availability and Maintainability Program Office, Wright-Patterson AFB, OH USA

Advanced CMS *Final Report*

Pratt, Edward M., Air Force Materiel Command, USA; Oct. 18, 1994; 88p; In English

Report No.(s): AD-A331763; PRAM-91-017; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

WR-ALC uses the Capacitance Measurement System (CMS) to determine fastener hole quality on C-141 and F-15 aircraft. The size of the original CMS system (300 pounds) made it inconvenient in the work area and affected reliability, accuracy, and repeatability of the system. Vibration problems, associated with transporting the unit across the flight line, affect the system reliability. Accuracy and repeatability are affected by the need of a long reach cable for the hole probe to reach all work areas on the aircraft without constantly moving the machine from location to location. The fifty foot reach cable that is required for the CMS is shielded; however, electromagnetic interference will still occur.

DTIC

Aircraft Maintenance; Dimensional Measurement; Fasteners; Position (Location); Reliability; Jet Aircraft; Fighter Aircraft

19980018338 Warner Robins Air Logistics Center, Robins AFB, GA USA

USAF PRAM Program: SMART Shop *Final Report*

Feb. 23, 1993; 17p; In English

Report No.(s): AD-A331663; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Avionics Management Production Division (WR-ALC/LYP) performs depot maintenance on 125,800 end items per year from more than 20 different aircraft. The basic depot maintenance philosophy has been to test an end item until a faulty function is found and then to narrow the test to identify a failed component. No visibility was given to the prior performance or failure

history. No one knew if a particular end item was frequently visiting the depot with the same or similar failures. Test and repair technicians did not have an on-line data collection and retrieval method of documenting and evaluating repair process improvement efforts. An excessive amount of time was spent manually processing data to and from management data systems external to the depot shop. A bar code based end item tracking and data collection system was designed for testing on four avionics production lines. A high priority was given to providing features which would replace paper-based tasks with bar code scanning techniques. Databases and application programs hosted on minicomputers would log test and repair data as it occurred. The accumulated history would immediately be available at terminals in the shop area. End item status, failure and repair data, replaced components, and field generated performance information were included. Information required by external data systems was assimilated and transferred electronically. The project was given the name SMART Shop (Statistical Maintenance and Repair Techniques).
DTIC
Avionics; Collection; Data Acquisition; Data Bases; Data Systems; Management Systems; Minicomputers

19980018468 Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine, France
Aerospace 2020, Volume 1 ***Aeronautique et Espace a l'Horizon 2020, Volume 1***
Dec. 1997; 44p; In French; See also English translation, AGARD-AR-360-Vol-1
Report No.(s): AGARD-AR-360-Vol(F); ISBN 92-836-2001-1; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Volume 1, the summary volume, of the report of the NATO Advisory Group for Aerospace Research and Development (AGARD) study: 'Aerospace 2020'. This study explores the most advanced technologies, relevant to aerospace, being researched and developed in laboratories today. The study focuses on the most promising current technologies and the organizational and tactical consequences they will have at the field and system levels, over the course of the next 25 years. Topics include: a discussion of the impact of proliferation, human-machine interaction, synthetic environments, directed-energy weapons, information technologies, unmanned tactical aircraft, suborbital launchers, hypersonic missiles, and a discussion of affordability issues. Technologies are assessed from the viewpoints of both potential capabilities and threats. Observations and recommendations are presented.
Author
Aerospace Engineering; Weapon Systems; North Atlantic Treaty Organization (NATO); Man Machine Systems; Hypersonics; Pilotless Aircraft; Fighter Aircraft

19980018600 Warner Robins Air Logistics Center, Robins AFB, GA USA
Carbon Dioxide Pellet Blasting Augmented Xenon Flashlamp Coatings Removal Design and Prototype Demonstration Project; PRAM Project ***Final Report***
Mar. 30, 1993; 141p; In English
Report No.(s): AD-A331833; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Air Force aircraft exterior coatings are removed every 4 to 8 years to facilitate various maintenance functions. One of the largest generators of hazardous waste in the Air Force has typically been the paint removal operations. Historically, the Air Force has used extremely harsh chemicals to remove the advanced coatings used on modern aircraft. Large volumes of hazardous waste (e.g., approximately 10,000 gallons for the F-15 aircraft) are produced with each aircraft that is stripped. In addition, the chemicals are not compatible with composite substrates.
DTIC
Flash Lamps; Paint Removal; Aircraft Maintenance

19980018672 Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine, France
Future Aerospace Technology in the Service of the Alliance, Volume 3, Sustained Hypersonic Flight ***Les Technologies Aeronautiques et Spatiales du Futur au Service de L'Alliance Atlantique, Volume 3, Le Vol en Croisiere Hypersonique***
Dec. 1997; 432p; In French; In English; AGARD Symposium on ' Future Aerospace Technology in the Service of the Alliance', 14-17 Apr. 1997, Palaiseau, France; Also announced as 19980018673 through 19980018705
Report No.(s): AGARD-CP-600-Vol-3; ISBN 92-836-0049-5; Copyright Waived; Avail: CASI; A19, Hardcopy; A04, Microfiche

Sustained Hypersonic Flight capability is envisioned for several future military and civilian applications, such as long range immediate reaction reconnaissance, high speed interception of air targets, long range precision strike against hardened or time critical targets, and access to space. The inherent reduction in time-to-target and low vulnerability will permit new operational tactics. The symposium outlined mission needs and operational scenarios for hypersonic vehicles. Addressed were: Technological issues and challenges in external hypersonic aerodynamics and design, propulsion and engine/airframe integration, military ram-

jet applications, overall system design including structures and materials development needs, and test facilities. Ground based test facilities cannot provide full simulation at Mach numbers above 5. Therefore, the use of Computational Fluid Dynamics design tools is essential. For routine use of the computational tools in analysis, design and optimization, it is necessary to reduce the time for the entire computational process by two orders of magnitude. Hypersonic boundary layer transition remains a critical design issue because of the important impact on engine drag and on heating, which can affect the choice of materials and thermal protection systems. In addition, reliable prediction of scramjet net thrust is an absolute must in resolving hypersonic air breathing vehicle design issues. Due to current facility and computational shortfalls, the development of future hypersonic flight systems requires research flight tests in the technology areas of boundary layer transition and air-breathing propulsion engine performance. For sustained hypersonic flight beyond Mach 6, the supersonic combustion ramjet (scramjet) engine is the only choice for the near future. Only this air-breathing concept offers a significant promise of large reductions in required propellant fractions, increased payload fractions, and reduced size vehicles, together with a foreseeable technological feasibility. Airframe/engine integration, combustor design and thermal management are the predominant engineering tasks. Fuels, hydrogen or hydrocarbon, must be matched to the operational needs of military or civil use. Experience in existing ramjet propelled missiles capable of speeds up to Mach 4 can support the development effort. The potential mission and cost benefits of sustained hypersonic flight to both military and civil applications are tremendous. From the budget point of view, the possibility of sharing development costs between military and civil programs offers a specific advantage.
Derived from text
Aerodynamics; Hypersonic Flight; Systems Engineering; Software Development Tools; Military Operations; Military Technology; Engine Airframe Integration; Design Analysis; Air Breathing Engines; Boundary Layer Transition; Flight Tests

02
AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

19980018310 McDonnell-Douglas Corp., Saint Louis, MO USA
Characterization of Receptivity in Jet Flow Control ***Final Report, May 1994 - May 1997***
Parekh, D. E., McDonnell-Douglas Corp., USA; Cain, A. B., McDonnell-Douglas Corp., USA; Vaporean, C. N., McDonnell-Douglas Corp., USA; Oct. 31, 1997; 64p; In English
Contract(s)/Grant(s): F49620-94-C-0029
Report No.(s): AD-A332805; AFOSR-TR-97-0724; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report describes a combined experimental and computational investigation of the receptivity of incompressible and compressible jets to acoustic and fluidic perturbations. Receptivity is the mechanism by which external disturbances transfer energy to instabilities in the flow. The focus of this research is characterizing jet receptivity for a broad range of actuator and flow parameters. The numerical computations explore the influence of forcing amplitude, combined harmonic and steady blowing, actuator location, Mach number, and temperature ratio. Experimental investigations compare the effectiveness of various types of actuators and document the flow response to high amplitude forcing by a periodic fluidic actuator.
DTIC
Jet Flow; Energy Transfer; Mach Number; Numerical Analysis

19980018623 Army Research Lab., Aberdeen Proving Ground, MD USA
Computational Modeling of a Finned Projectile by Chimera Technique ***Final Report***
Edge, Harris L., Army Research Lab., USA; Sahu, Jubaraj, Army Research Lab., USA; Dec. 1997; 38p; In English
Report No.(s): AD-A334011; ARL-TR-1443; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A computational study was performed to compute the aerodynamic coefficients of a long-range finned projectile configuration at a transonic velocity of Mach 0.95 for multiple angles of attack. A zonal, implicit, Navier-Stokes computational technique, along with the Chimera overset grid approach, has been used to compute the projectile flow field. The application of the Chimera approach allowed for improved efficiency in terms of placing grid points where they are needed the most. This technique is promising for future flow field computations of finned projectiles. The aerodynamic coefficients computed are then compared with those computed through application of a design code to show comparable results.
DTIC
Aerodynamic Coefficients; Computational Grids; Grid Generation (Mathematics); Navier-Stokes Equation; Problem Solving; Angle of Attack

19980018639 Defense Group, Inc., San Diego, CA USA

The Effects of Crossflow on the Pressures and Lift Induced by the Fountain Generated Between Two Impinging Jets

Kuhn, Richard E., Defense Group, Inc., USA; Feb. 1998; 63p; In English

Contract(s)/Grant(s): NAS2-14384; RTOP 505-68-32

Report No.(s): NASA/CR-1998-206955; A-98-09726; NAS 1.26:206955; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

When a jet STOVL aircraft is hovering, or in a crossflow, while close to the ground wall jets flowing radially outward from the impingement points of the jets are generated. An upflow, or fountain, is generated where the wall jets from adjacent jets meet on the ground surface. The induced lift and suckdown generated by the impingement of the fountain on the lower surface of the configuration has been the subject of previous studies. This study analyzes the limited available pressure and force data on the effect of crossflow on the fountain induced lift and suckdown. The analysis includes the effects of jet spacing, height and operating conditions. However, it is limited to twin jet configurations of circular, vertical jets operating at subcritical nozzle pressure ratios over a fixed ground surface.

Author

Cross Flow; STOVL Aircraft; Lift

19980018682 Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese, Belgium

External Hypersonic Aerodynamics: State-of-the-Art and Future Perspective

Wendt, John F., Von Karman Inst. for Fluid Dynamics, Belgium; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 8p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

An overview is provided on the activities, conclusions and recommendations of AGARD Working Group 18. Four issues were defined and addressed; shock wave boundary layer interactions, transition, real-gas effects, and rarefied-flow effects. Three status reports were prepared on calibration procedures for high-enthalpy facilities, extrapolation of wind tunnel results to flight, and real-gas facilities. While considerable progress has been made in our understanding of external hypersonic flows through experiments in new facilities, advances in CFD, and improved modelling of complex phenomena, more efforts must be devoted to this area if the risks of failure or overdesign are to be reduced to acceptable levels. Specifically, resources should be allocated to: u resolve facility, computational, and modelling deficiencies u accelerate the multiple facility/multiple computation strategy with standard models employed by Working Group 18.

Derived from text

Hypersonic Flow; Aerodynamics; Boundary Layer Transition; Shock Wave Interaction; Rarefied Gas Dynamics; Real Gases; Extrapolation

19980018684 Calspan-Buffalo Univ. Research Center, NY USA

Aerothermal Characteristics of Shock/Shock Interaction Regions in Hypersonic Flows

Holden, Michael S., Calspan-Buffalo Univ. Research Center, USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 14p; In English; Also announced as 19980018672

Contract(s)/Grant(s): SDIO84-93-C-0001; F49620-95-1-0292; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

A review is presented of the aerothermal characteristics of regions of shock/shock interaction in hypersonic flow. Here, we discuss four aspects of the problem: (1) the requirements for accurate measurements in these flows; (2) the characteristics of shock/shock interaction regions in rarefied and laminar flows; (3) the aerothermal loads generated in transitional regions of shock/shock interaction; and (4) real-gas effects in regions of shock/shock interaction. The characteristics of shock/shock interaction regions and the influence of Mach number and Reynolds number on the heating loads developed in them are discussed. Correlations are presented together with the results of semi-empirical prediction methods to describe the aerothermal loads spanning the non-continuum to high Reynolds number flow regime. Some preliminary results are presented to demonstrate that the real-gas effects act to diffuse and lower the aerothermal loads relative to the ideal gas environment.

Derived from text

Aerothermodynamics; Shock Wave Interaction; Hypersonic Flow; Laminar Flow; Rarefied Gas Dynamics; Real Gases

19980018685 NASA Langley Research Center, Hampton, VA USA

Advances in Computational Capabilities for Hypersonic Flows

Kumar, Ajay, NASA Langley Research Center, USA; Gnoffo, Peter A., NASA Langley Research Center, USA; Moss, James N., NASA Langley Research Center, USA; Drummond, J. Philip, NASA Langley Research Center, USA; Future Aerospace Technol-

ogy in the Service of the Alliance; Dec. 1997; Volume 3; 14p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

The paper reviews the growth and advances in computational capabilities for hypersonic applications over the period from the mid-1980's to the present day. The current status of the code development issues such as surface and field grid generation, algorithms, physical and chemical modeling, and validation is provided. A brief description of some of the major codes being used at NASA Langley Research Center for hypersonic continuum and rarefied flows is provided, along with their capabilities and deficiencies. A number of application examples are presented, and future areas of research to enhance accuracy, reliability, efficiency, and robustness of computational codes are discussed.

Derived from text

Hypersonic Flow; Computer Programs; Grid Generation (Mathematics); Algorithms; Computer Systems Performance

19980018686 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. fuer Stroemungsmechanik, Goettingen, Germany

Computational Simulation of Hypersonic External Flow: Status of CFD in Europe

Kordulla, W., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Morice, Ph., Office National d'Etudes et de Recherches Aerospatiales, France; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 16p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper attempts to review the status of computational simulation of hypersonic flow achieved in Europe (except for the work performed in the countries of the former Soviet Union) within the past five to ten years. It is shown that national and concerted European efforts fostered the development of CFD in intimate combination with experimental work, in particular for validation purposes. It is believed that the state achieved, although not yet perfect, will be of tremendous help for the design process of an operational vehicle.

Derived from text

Hypersonic Flow; Simulation; Computational Fluid Dynamics; Europe

19980018687 Arizona State Univ., Tempe, AZ USA

Drag Prediction and Transition in Hypersonic Flow

Reed, Helen L., Arizona State Univ., USA; Kimmel, Roger, Wright Lab., USA; Schneider, Steven, Purdue Univ., USA; Arnal, Daniel, Office National d'Etudes et de Recherches Aerospatiales, France; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 18p; In English; Also announced as 19980018672

Contract(s)/Grant(s): F49620-97-0037; NAG1-1886; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper discusses progress on issues such as instability studies, nose-bluntness and angle-of-attack effects, and leading-edge-contamination problems from theoretical, computational, and experimental points of view. Also included is a review of wind-tunnel and flight data, including high-Re flight transition data, the levels of noise in flight and in wind tunnels, and how noise levels can affect parametric trends. A review of work done on drag accounting and the role of viscous drag for hypersonic vehicles is also provided.

Derived from text

Hypersonic Flow; Angle of Attack; Drag; Leading Edges; Noise Intensity

19980018693 NASA Langley Research Center, Hampton, VA USA

Hypersonic Flight Experimentation - Status and Shortfalls

Bushnell, Dennis M., NASA Langley Research Center, USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 8p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

For some 50 years, man has flown, very successfully, in and through the hypersonic flow regime up to Mach Number 35 and beyond with very few "surprises." In general, hypersonic vehicles have performed successfully with good-to-excellent comparisons between flight, ground facility extrapolations and computations being the norm. A consistent and glaring shortfall to date is in the boundary layer transition arena, due primarily to the dominance for flight vehicles of roughness induced transition where the roughness characteristics are extremely vehicle specific and dictated by either vehicle operational exigencies such as antennas, handling plugs, and field joints, etc. or characteristics of the thermal protection system. Emerging shortfalls for future systems which require research flight tests include transition and air-breathing propulsion-related technology for both cruise and space access. Specific flight test recommendations include "systems demonstrations" for various air-breathing propulsion options and efforts to correct a pervasive lack of adequate analysis of the existing, and very expensive to replicate, hypersonic flight data base.

Derived from text

Hypersonic Flight; Hypersonic Flow; Boundary Layer Transition; Hypersonic Vehicles; Flight Tests; Surface Roughness

19980018698 Daimler-Benz Aerospace A.G., Munich, Germany

Aerothermodynamics and Propulsion Integration: Synthesis of the AGARD-FDP-VKI Special Course, April 15-19, 1996

Hirschel, E. H., Daimler-Benz Aerospace A.G., Germany; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 8p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

The AGARD-FDP-VKI Special Course "Aerothermodynamics and Propulsion Integration for Hypersonic Vehicles" dealt with basic topics of aerothermodynamics, with configurational aerothermodynamic of re-entry vehicles, airbreathing vehicles and missiles, and with inlet and aerothermodynamic airframe/propulsion integration of RAM and SCRAM propelled vehicles. In this paper the contributions, which were devoted to aerothermodynamic airframe/propulsion integration in the widest sense, are synthesized. After a general discussion of the problem, the main topics forebody, inlet, nozzle/afterbody, the whole vehicle, are detailed, partly with illustrating examples. Finally the potentials and deficits of simulation means are considered.

Derived from text

Aerothermodynamics; Air Breathing Engines; Engine Airframe Integration; Hypersonic Vehicles; Forebodies; Simulation; Inlet Nozzles; Afterbodies

19980018801 Naval Surface Warfare Center, Hydromechanics Directorate, Bethesda, MD USA

Blade Section Lift Coefficients for Propellers at Extreme Off-Design Conditions ***Topical Report, Oct. 1996 - Sep. 1997***

Shen, Young, Naval Surface Warfare Center, USA; Fuhs, Donald, Naval Surface Warfare Center, USA; Dec. 1997; 41p; In English

Report No.(s): AD-A333573; CRDKNSWC-HD-1205-02; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Propeller Force Module (PFM) code developed by Analytical Methods Inc. (AMI) for calculating propeller side forces during maneuvering simulation studies requires inputs of propeller blade sectional lift, drag, and moment data. A set of steady two-dimensional foil force data for NACA profiles is normally used by PFM as input. Wake survey data show that the propeller blade sections will encounter large spatial variations in angle of attack during maneuvers. A literature search is conducted to review the effect of unsteady angle of attack fluctuations on two-dimensional hydrodynamic forces. Methods to calculate unsteady hydrodynamic loads are evaluated, and a method selected for use with the PFM code.

DTIC

Hydrodynamics; Stalling; Propellers; Propeller Blades; Surveys; Wakes

19980018824 Massachusetts Inst. of Tech., Gas Turbine Lab., Cambridge, MA USA

Active Control of Aeroelasticity and Internal Flows in Turbomachinery ***Final Report, 1 Nov. 1992 - 30 Apr. 1996***

Epstein, Alan H., Massachusetts Inst. of Tech., USA; Paduano, James D., Massachusetts Inst. of Tech., USA; Greitzer, Edward M., Massachusetts Inst. of Tech., USA; Aug. 1996; 187p; In English

Contract(s)/Grant(s): F49620-93-I-0032

Report No.(s): AD-A332851; AFOSR-97-0709TR; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The research conducted was focused in two areas. The first is active control of rotating stall when inlet distortion is present. This research was carried out on the low speed 3-stage active control research compressor at MIT=GTL. The second area of research was active control of surge in centrifugal and axi-centrifugal engines. Stabilization of such engines beyond their normal stability boundary requires control of 1D oscillations which lead to surge rather than the higher dimensional oscillations which lead to rotating stall. Typically surge control alone allows uncontrolled rotating stall modes to go unstable, which would be debilitating (and probably eventually lead to surge) in an axial compression system. Rotating stall in centrifugal compressors, however, is quite different. If one can prevent surge in a centrifugal machine, rotating stall causing gradual, recoverable performance degradation of the compressor. Thus active control of surge alone can increase engine operating range in engines containing centrifugal compressors.

DTIC

Active Control; Aeroelasticity; Internal Flow; Rotating Stalls; Centrifugal Compressors; Gas Turbines

19980019278 NASA Langley Research Center, Hampton, VA USA

Computational/Experimental Aeroheating Predictions for X-33, Phase 2, Vehicle

Hamilton, H. Harris, II, NASA Langley Research Center, USA; Weilmuenster, K. James, NASA Langley Research Center, USA; Horvath, Thomas J., NASA Langley Research Center, USA; Berry, Scott A., NASA Langley Research Center, USA; 1998; 16p; In English; 36th; Aerospace Sciences Meeting and Exhibit, 12-15 Jan. 1998, Reno, NV, USA

Report No.(s): NASA/TM-1998-207315; NAS 1.15:207315; AIAA Paper 98-0869; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Laminar and turbulent heating-rate calculations from an ”engineering” code and laminar calculations from a ”benchmark” Navier-Stokes code are compared with experimental wind-tunnel data obtained on several candidate configurations for the X-33 Phase 2 flight vehicle. The experimental data were obtained at a Mach number of 6 and a freestream Reynolds number ranging from 1 to 8 x 10(exp 6)/ft. Comparisons are presented along the windward symmetry plane and in a circumferential direction around the body at several axial stations at angles of attack from 20 to 40 deg. The experimental results include both laminar and turbulent flow. For the highest angle of attack some of the measured heating data exhibited a ”non-laminar” behavior which caused the heating to increase above the laminar level long before ”classical” transition to turbulent flow was observed. This trend was not observed at the lower angles of attack. When the flow was laminar, both codes predicted the heating along the windward symmetry plane reasonably well but under-predicted the heating in the chine region. When the flow was turbulent the LATCH code accurately predicted the measured heating rates. Both codes were used to calculate heating rates over the X-33 vehicle at the peak heating point on the design trajectory and they were found to be in very good agreement over most of the vehicle windward surface. Author

Aerodynamic Heating; X-33 Reusable Launch Vehicle; Wind Tunnel Tests; Angle of Attack; Turbulent Flow; Laminar Flow; Navier-Stokes Equation; Computational Fluid Dynamics

19980019287 Fukuyama Univ., Japan

New Method for Visualizing Three-Dimensional Shock Shapes Around Hypersonic Vehicles Using an Electrical Discharge

Nishio, Masatomi, Fukuyama Univ., Japan; American Inst. of Aeronautics and Astronautics, Inc.; Dec. 1990; Volume 28, No. 12, pp. 2085-2091; In English; Copyright; Avail: Issuing Activity (American Inst. of Aeronautics and Astronautics, Inc., 370 L’Enfant Promenade, SW, Washington, DC 20024), Hardcopy, Microfiche

This paper describes a new method for visualizing three-dimensional shock shapes around hypersonic vehicles using an electrical discharge. The method is based on the following ideas. When an electrical discharge is generated across a shock wave, the shock wave can be seen as a dark portion in the electrical discharge. The three-dimensional shock shape can be visualized by taking a discharge photograph in the rear direction of the flow. The method was developed to make it possible to visualize wide field shock shapes around vehicles using a single electrical discharge. First, a lateral shock shape over a wedge was visualized to investigate the accuracy of the shock shape obtained by the new method. The visualized result was compared with a schlieren photograph, and it was found that the results of both agreed sufficiently. This proved that the new method is a viable method for visualizing shock shapes. Next, a detached cross-sectional shock shape over a delta wing was successfully visualized. Cross-sectional shock shapes cannot be visualized by such optical systems as the schlieren method. Therefore, it can be concluded that the new method is superior for visualizing three-dimensional shock shapes.
Author

Hypersonic Vehicles; Electric Fields; Shock Waves; Shapes; Ionization Potentials; Electric Discharges

19980019299 Arizona State Univ., Mechanical and Aerospace Engineering, Tempe, AZ USA

Swept-Wing Receptivity Studies Using Distributed Roughness ***Annual Report***

Saric, William S., Arizona State Univ., USA; Jan. 1998; 26p; In English

Contract(s)/Grant(s): NCC1-194; ZA0078; NAG1-1925

Report No.(s): NASA/CR-1998-206782; NAS 1.26:206782; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper reviews the important recent progress in three-dimensional boundary-layer transition research. The review focuses on the crossflow instability that leads to transition on swept wings with a favorable pressure gradient. Following a brief overview of swept-wing instability mechanisms and the crossflow problem, a summary of the important findings of the 1990s is given. The discussion is presented from the experimental viewpoint, highlighting the ITAM work of Kachanov and co-workers, the DLR experiments of Bippes and co-workers, and the Arizona State University (ASU) investigations of Saric and co-workers. Where appropriate, relevant comparisons with CFD are drawn. The recent (last 18 months) research conducted by the ASU team is described in more detail in order to underscore the latest developments concerning nonlinear effects and transition control. Author

Swept Wings; Pressure Gradients; Boundary Layer Transition; Cross Flow; Nonlinearity

19980019309 NASA Langley Research Center, Hampton, VA USA

X-34 Experimental Aeroheating at Mach 6 and 10

Berry, Scott A., NASA Langley Research Center, USA; Horvath, Thomas J., NASA Langley Research Center, USA; DiFulvio, Michael, NASA Langley Research Center, USA; Glass, Christopher, NASA Langley Research Center, USA; Merski, N. Ronald, NASA Langley Research Center, USA; 1998; 18p; In English; 36th; Aerospace Sciences Meeting and Exhibit, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations

Report No.(s): NASA/TM-1998-207319; NAS 1.15:207319; AIAA Paper-98-0881; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Critical technologies are being developed to support the goals of the NASA Office of Aeronautics and Space Transportation Technology Access to Space initiative for next-generation reusable space transportation systems. From the perspective of aerothermodynamic performance throughout the flight trajectory, the Reusable Launch Vehicle program incorporates conceptual analysis, ground-based testing, and computational fluid dynamics to provide flyable suborbital flight demonstrator vehicles. This report provides an overview of the hypersonic aeroheating wind tunnel test program conducted at the NASA Langley Research Center in support of one of these vehicles, the X-34 small reusable technology demonstrator program. Global surface heat transfer images, surface streamline patterns, and shock shapes were measured on 0.0153- and 0.0183-scale models of proposed X-34 flight vehicles at Mach 6 and 10 in air. The primary parametrics that were investigated include angles-of-attack from 0 to 35 deg. and freestream unit Reynolds numbers from 0.5 to 8 million per foot (which was sufficient to produce laminar, transitional, and turbulent heating data), both with and without control surface deflections. Comparisons of the experimental data to computational predictions are included, along with a discussion of the implications of some of the experimental flow features for the flight vehicle. Author

Heat Transfer; Computational Fluid Dynamics; Aerothermodynamics; Space Transportation System; Suborbital Flight; X-34 Reusable Launch Vehicle

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

19980018003 Research Triangle Inst., Research Triangle Park, NC USA

Survey Summary of AGATE Concepts Demonstration at Annual NATA Convention March 24-26, 1997, Volume 2, Original Survey Data ***Final Report***

Dec. 1997; 216p; In English; Annual NATA Convention, 24-26 Mar. 1997, USA

Contract(s)/Grant(s): NAS1-19214; RTOP 538-07-19-01

Report No.(s): NASA-CR-201731/Vol-2; NAS 1.26:201731/Vol-2; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

An AGATE Concepts Demonstration was conducted at the Annual National Air Transportation Association (NATA) Convention in 1997. Following, a 5-minute introductory briefing, an interactive simulation of a single-pilot, single-engine aircraft was conducted. The participant was able to take off, fly a brief enroute segment, fly a Global Positioning System (GPS) approach and landing, and repeat the approach and landing segment. The participant was provided an advanced 'highway-in-the-sky' presentation on both a simulated head-up display and on a large LCD head-down display to follow throughout the flight. A single-lever power control and display concept was also provided for control of the engine throughout the flight. A second head-down, multifunction display in the instrument panel provided a moving map display for navigation purposes and monitoring of the status of the aircraft's systems.

Author

Computerized Simulation; Surveys; Air Transportation

19980018085 NERAC, Inc., Tolland, CT USA

Accident Investigations: Aircraft. (Latest citations from the NTIS Bibliographic Database)

Jan. 1996; In English; Page count unavailable.

Report No.(s): PB96-859046; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the results of aircraft accident investigations. Topics include accident reports, aviation accidents, helicopters, and civil aviation. (Contains 50-250 citations and includes a subject term index and title list.) NTIS

Bibliographies; Aircraft Accident Investigation

19980018502 Nebraska Univ., Aviation Inst., Omaha, NE USA

The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society, Volume 3

Oum, T. H., British Columbia Univ., Canada; Bowen, B. D., Nebraska Univ., USA; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR SocietyVol.3-1; Sep. 1997; 216p; In English; The Conference Proceedings of

the 1997 Air Transport Research Group of the WCTR Society, 25-27 Jun. 1997, Vancouver, Canada; Sponsored by British Columbia Univ., Canada; Also announced as 19980018503 through 19980018512
Report No.(s): NASA/CR-97-206485; UNOAI-97-7; NAS 1.26:206485; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This paper covers topics such as: Safety and Air Fares; International Airline Safety; Multi-fare Seat Allocation Problem; Dynamic Allocation of Airline Seat Inventory; Seat Allocation on Flights with Two Fares; Effects of Intercontinental Alliances; Domestic Airline Mergers; Simulating the Effects of Airline Deregulation on Frequency Choice; and Firm Size Inequality and Market Power.
Derived from text
Air Transportation; Aircraft Safety; Airline Operations; Flight Safety; Simulation; Seats

19980018505 University of Southern California, Political Economy and Public Policy, Santa Barbara, CA USA
Domestic Airline Mergers: Strategic Reactions to Imperfectly Competitive International Aviation Markets
Clougherty, Joseph A., University of Southern California, USA; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 3, No. 1; 34p; In English; Also announced as 19980018502; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

There are two related hypotheses developed in this chapter, both of which center on the effect of domestic mergers on airline international competitive performance. The first hypothesis is that domestic airline mergers improve the international competitive position of airlines. The second hypothesis is that high domestic airline industry concentration can improve a nation's international competitive position. The first hypothesis (hereafter the Airline Competitiveness hypothesis) suggests an international strategic incentive for airlines to seek domestic mergers. Imperfectly competitive international markets provide incentive for international carriers to increase efficiency in order to earn greater international market traffic and profit shares. Domestic airline mergers airline's an airline's costs by matching extensive domestic route networks with international route rights. Domestic networks generate domestic sources of passenger traffic that support international operations by lowering the average cost per passenger. It behooves international airlines to acquire domestic competitors and become more competitive in international markets. It should not be forgotten that airlines are also motivated by domestic efficiency and market power incentives in seeking domestic acquisitions. The claim here is that international competitive incentives are an important contributing factor behind domestic airline mergers.
Derived from text
Airline Operations; Commercial Aircraft; Civil Aviation; Market Research; Routes; Costs

19980018506 British Columbia Univ., Faculty of Commerce and Business Administration, Vancouver, British Columbia Canada
Effects of International Alliances: Cases in the North Atlantic Market
Park, Jong-Hun, British Columbia Univ., Canada; Zhang, Anming, Hong Kong Univ., Hong Kong; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 3, No. 1; 29p; In English; Also announced as 19980018502; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This study empirically investigates the effects on air fares, passenger volume, service quality, and alliance partner's traffic of four major alliances in North Atlantic aviation markets. The four alliances are British Airways-USAir, Delta-Sabena-Swissair, KLM-Northwest, and Lufthansa-United Airlines alliances. We find that equilibrium passenger volume increases by an average of 35,998 passengers annually and equilibrium air fares decrease by $41 on average on the routes where the four alliances occurred, and that consumers are better off due to the alliances. In general, schedule delay times are reduced during the post-alliance period of the alliances. We also find that most of the partners have experienced greater traffic increases on their alliance routes than those on their non-alliance routes.
Author
Airline Operations; Schedules; Market Research; Consumers; Commercial Aircraft

19980018507 Nanyang Univ., Div. of Applied Economics, Singapore
Seat Allocation Game on Flights with Two Fares
Li, Michael Z. F., Nanyang Univ., Singapore; Oum, Tae H., British Columbia Univ., Canada; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 3, No. 1; 9p; In English; Also announced as 19980018502; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

In this paper, we will introduce the seat allocation game between two airlines for flights with two fares. The strategic variable of this game is either the booking limit for the low fare or the protection level for the high fare. We have shown that under the proportional splitting rule (for the market demand), there exists an equilibrium booking strategy such that both airlines will protect

the same number of seats for the full fare which depends upon the joint capacity level. In addition, it is shown that at equilibrium, the total number of seats available for the discount fare is smaller than the total number of seats that would be available if the two airlines collude and act as a monopoly. Under the equal splitting rule and deterministic demand, there exists an equilibrium such that each airline will protect enough seats for high fare so that each airline will split the market demand for the high fare equally.
Author
Airline Operations; Seats; Consumers; Commercial Aircraft

19980018508 British Columbia Univ., Vancouver, British Columbia Canada
Dynamic Allocation of Airline Seat Inventory with Batch Arrivals
Brumelle, Shelby, British Columbia Univ., Canada; Walczak, Darius, British Columbia Univ., Canada; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 3, No. 1; 25p; In English; Also announced as 19980018502; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

When a customer requests a discount fare, the airline must decide whether to sell the seat at the requested discount or to hold the seat in hope that a customer will arrive later who will pay more. We model this situation for a single leg flight with multiple fare classes and customers who arrive according to a semi-Markov process and who can request multiple seats (batch requests). Under certain conditions (e.g. the probability that each arrival is the last of its type increases as the time of arrival gets closer to departure), we show that the value function decreases as departure approaches. If each customer only requests a single seat or if the requests can be partially satisfied, then we show that there is an optimal booking curve which decreases as departure approaches. We also provide counter examples to show that this structural property of the optimal policy need not hold for more general arrival processes if the requests can be for more than one seat and must be accepted or rejected as a whole.
Author
Airline Operations; Inventories; Seats; Costs; Markov Processes

19980018509 Nanyang Univ., Div. of Applied Economics, Singapore
On the Multi-fare Seat Allocation Problem
Li, Michael Z. F., Nanyang Univ., Singapore; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 3, No. 1; 12p; In English; Also announced as 19980018502; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper studies the seat allocation problem for multi-fare single-leg flights with independent demands. It proves that three existing models for the seat allocation problem for mult-fare flights with independent demands all have equivalent optimality conditions, which clarifies the issue on which model has the computational advantage over the others. This equivalency result may also shed new light on the seat allocation for multi-fare flight with dependent demands.
Author
Airline Operations; Civil Aviation; Seats; Costs; Commercial Aircraft; Demand (Economics)

19980018510 George Mason Univ., Inst. of Public Policy, Fairfax, VA USA
International Airline Safety in a World of Alliances
Button, Kenneth, George Mason Univ., USA; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 3, No. 1; 18p; In English; Also announced as 19980018502; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Aviation is becoming increasingly internationalized not only because international traffic is itself growing rapidly but also because airlines are themselves beginning to lose their national identity as cross-equity holdings expand and as airline alliances grow in number. These changes affect the commercial and the regulatory environment in which aviation services are provided but they also have potential implications for air transport safety. Although air transport safety is often treated as part of public policy, it is also influenced by the commercial interests of the airlines themselves. While there has been a recognition of the need for a public policy response to the new world of globalization and strategic alliances that are now part of the air transport market, this policy response needs to be made in the context of changing private incentives affecting airlines' own attitudes to safety. This paper focuses on the changes in private incentives that the growth in airline alliances in particular may have on safety.
Author
Air Transportation; Aircraft Safety; Airline Operations; Commercial Aircraft; Flight Safety

19980018511 Geneva Univ., Dept. of Economics, Geneva, Switzerland
Airport Hubbing and the Inclusion of Environmental Costs on Airport Pricing: A Theoretical Analysis
Nero, Giovanni, Geneva Univ., Switzerland; Black, John, New South Wales Univ., Australia; The Conference Proceedings of the

1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 3, No. 1; 23p; In English; Also announced as 19980018502; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Research into the effects of airport hub-and-spoke network has tended to concentrate on the economic dimensions such as market power, airline fares and barriers to entry. Airline hubbing has considerably altered airport economics. Hub-and-spoke networking has clearly increased the number of flights into and out of a major airport with its associated increase in externalities such as airside and landside congestion, aircraft noise and emissions. The principal contribution of our paper is to focus on these externalities associated with extensive hubbing. to this end, Schmalensee's [1977] model is adapted to allow for a monopolist airline to determine the optimal network and, in a second stage, to set prices and the number of flights. The paper explores the effect of charging the airline for these externalities through an 'environmental' tax when it operates a hub-and-spoke network. We examine two scenarios, a passenger-related tax and an aircraft-related tax. We show the extent to which prices and the number of flights are affected by the tax. Finally, the paper reviews current charges related to environmental externalities, with a focus on data derived from noise management studies at Sydney (Kingsford Smith) Airport, Australia.

Author

Airline Operations; Economics; Costs; Passengers; Airports

19980018512 Universidad de Las Palmas de Gran Canaria, Dept. de Economia Aplicada, Las Palmas, Spain

Safety and Air Fares

Betancor, Ofelia, Universidad de Las Palmas de Gran Canaria, Spain; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 3, No. 1; 17p; In English; Also announced as 19980018502; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

When a passenger boards a plane he does not know whether he is choosing a safe or a risky airline. However there might be some sort of signal. We can already find some evidence in the literature regarding how profits influence the level of safety, though the signal might be also found through the price mechanism. In this paper we try to test if cheaper airlines means a greater risk of accident. The data utilized to that end is a panel of 31 airlines during the period 1970-1995. All AEA members are included plus some other international carriers that will be used as a control group. Data about accidents is collected from The World Directory of Airliner Crashes and is fully available for the whole period, while data regarding level of activities and average incomes come from AEA Yearbooks and IATA WATS publications, though for the period 1984-1995. Preliminary results using Poisson estimates and controlling for different levels of activity, suggest a negative and robust relationship between number of accidents or number of fatalities and yield. If accepted, it might imply either airlines have managed to escape the civil aviation controls on safety or that these have proved to be imperfect.

Author

Aircraft Safety; Airline Operations; Flight Safety; Passengers; Crashes; Risk; Commercial Aircraft

19980018513 Nebraska Univ., Aviation Inst., Omaha, NE USA

The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society, Volume 3

Oum, Tae Hoon, Editor, Nebraska Univ., USA; Bowen, Brent D., Editor, Nebraska Univ., USA; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR SocietyVol.3-2; Sep. 1997; 152p; In English; The Conference Proceedings of the 1997 Air Transport Research Group of the WCTR Society, 25-27 Jun. 1997, Vancouver, Canada; Also announced as 19980018514 through 19980018520

Report No.(s): NASA/CR-97-206484; NAS 1.26:206484; UNOAI-97-8; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Topics discussed include the following: Airline Demand and Forecasting, Quality of Service, Competition and Productivity, and Consumer Choice on Air Travel.

Derived from text

Air Transportation; Airline Operations; Consumers; Productivity; Forecasting

19980018514 Manitoba Univ., Faculty of Management, Winnipeg, Manitoba Canada

Modelling Air Passenger Judgements and Choices Using Conjoint Methodology

Bruning, Edward R., Manitoba Univ., Canada; Prentice, Barry E., Manitoba Univ., Canada; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 3, No. 2; 25p; In English; Also announced as 19980018513; Sponsored in part by Social Science and Humanities Research Council of Canada.; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

The effectiveness of multiattribute methods for analyzing consumer preferences depends ultimately on their ability not only to represent preferences for the product or choice situation of interest, but also how those preferences are related to choices in

real-world situations. Conjoint analysis represents a class of multiattribute modelling approaches employed to uncover underlying preference structures and, furthermore, maps preference structures to actual choices. The primary purpose of this study is to assess the optimal number of attributes to include in a conjoint experiment involving the decision of which air carrier to select for a pleasure trip. Researchers have discovered that the reliability and validity of conjoint results are critically related to the number of stimuli (attributes) included in the experiment (Green and SRinivasan). Too many attributes increases confusion while too few renders the choice situation highly unreal to participants. We employ measures of model aptness and predictive efficiency to assess the optimal number of factors. A second purpose is to determine the importance of carrier country of origin in the airline choice decision. Academic researchers have reported evidence that in many product categories the country of origin or manufacturing of the product affected consumer purchase decisions and quality assessments. We wish to test the country of origin effect in the present study. The remaining sections of the paper address the literature focusing on conjoint analysis, the experiment conducted to empirically assess the optimal number of attributes, and the implications for air passenger choice modelling.
Derived from text
Air Transportation; Airline Operations; Predictions; Passengers; Reliability

19980018515 Tokyo Inst. of Tech., Dept. of Civil Engineering, Tokyo, Japan
Analysis on the Airline Network Expansion and its Influences on the Passengers in the Asia-Pacific Region
Takada, Kazuyuki, Tokyo Inst. of Tech., Japan; Yai, Tetsuo, Tokyo Inst. of Tech., Japan; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 3, No. 2; 10p; In English; Also announced as 19980018513; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

The international aviation service in the Asia Pacific region has improved with the increasing demand in accordance with economic growth in Asian countries. The international aviation network in this region, which has not been sufficiently studied for making the international aviation policies, is the focus on this study. Some aviation policies might produce undesirable results for users because of decrease of service level. The purpose of this paper is to analyze international aviation network quantitatively in terms of airline network structure and user benefit. Firstly, the relationship between airline networks is examined considering airport pairs which are served by airlines. The airports and routes of each airline determine the relationship. Two indices that express respectively the degree of competition and the degree of complementation between networks are proposed in this study. The fact that the recent improvements of the international aviation network in this region have changed mutual relationships is demonstrated using these indices. Actually, such improvements of network affect the travel behavior of passengers. Therefore, it is necessary to consider the passenger evaluation of the change of network; design. The international service choice models that show the differences of preference for international aviation service such as fare, frequency and time are estimated by passenger's nationalities. The user benefit which is derived from the willingness to pay for the service changes is then calculated. One case study considering the Japanese, the Korean and the American passengers is undertaken to measure the user benefit for the recent service change by the major airline companies.
Derived from text
Airline Operations; Asia; Commercial Aircraft; Network Analysis; Passengers; Civil Aviation

19980018516 Bombardier, Inc., Bombardier Regional Aircraft, Montreal, Quebec Canada
New Technology Aircraft: Catalysts for Regional Market Growth
Ngo, Trung, Bombardier, Inc., Canada; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 3, No. 2; 32p; In English; Also announced as 19980018513; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

There are many factors, such as increasing demand and airport investment, introduction of open sky policy and the increasing airline alliances and mergers, which may cause drastic change in aviation network; structure in the Asian region. Therefore, the possible consequences caused by the structural change of network; are quantitatively analyzed in order to decide the suitable aviation policy. In this study, the international aviation network in Asian region, where quantitative analysis is not advanced, is analyzed to evaluate its structure. Two indices that can explain the mutual relationship such as competition and complementation between networks are proposed. The international service choice models are estimated by nationalities to analyze the effects of service changes from the passenger's viewpoint. Now, the simulation system to examine the effects of network changes in terms of network structures and user benefit is under construction. In addition, it is necessary to expand the region to be studied from three countries Japan, Korea and U.S.) to a wider region and examine the present aviation policies.
Derived from text
Airline Operations; Quantitative Analysis; Passengers; Simulation; Asia

19980018517 Wichita State Univ., School of Business, Wichita, KS USA

Airline Quality Rating: Results 1997

Headley, Dean E., Wichita State Univ., USA; Bowen, Brent D., Nebraska Univ., USA; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 3, No. 2; 11p; In English; Also announced as 19980018513; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

The Airline Quality Rating (AQR) was developed and first announced in early 1991 as an objective method of comparing airline performance on combined multiple factors important to consumers. Development history and calculation details for the AQR rating system are detailed in The Airline Quality Rating 1991 issued in April, 1991, by the National Institute for Aviation Research at Wichita State University. This current report, Airline Quality Rating 1997, contains monthly Airline Quality Rating scores for 1996. Additional copies are available by contacting Wichita State University or University of Nebraska at Omaha. The Airline Quality Rating 1997 is a summary of month-by-month quality ratings for the nine major domestic U.S. airlines operating during 1996. Using the Airline Quality Rating system and monthly performance data for each airline for the calendar year of 1996, individual and comparative ratings are reported. This research monograph contains a brief summary of the AQR methodology, detailed data and charts that track comparative quality for major domestic airlines through the 12 month period of 1996, and industry average results. Also, comparative Airline Quality Rating data for 1991 through 1995 are included to provide a longer term view of quality in the industry.

Derived from text

Airline Operations; Ratings; Commercial Aircraft; Civil Aviation

19980018518 British Columbia Univ., Faculty of Commerce and Business Administration, Vancouver, British Columbia Canada

Productivity and Price Trends in the World's Major Airlines 1986-1995

Waters, W. G., II, British Columbia Univ., Canada; Oum, Tae Hoon, British Columbia Univ., Canada; Yu, Chunyan, British Columbia Univ., Canada; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 3, No. 2; 19p; In English; Also announced as 19980018513; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

This paper tracks indices of prices received for airline outputs relative to the prices paid for inputs (labelled "total price productivity" TPP) in comparison with trends in total factor productivity TFP (ratio of output and input quantity indices). Comparing TFP and TPP reveals the sharing of productivity gains between a company and its customers, and hence the change in the firms financial performance. Data are updated from Oum and Yu. Data are for 22 of the world's major air carriers. The output quantity index incorporates five output categories: revenue passenger kilometres from scheduled services, freight tonne-kilometres, non-scheduled passenger and freight services, mail service, and incidental revenues. There are five input categories: labour, fuel, flight equipment, ground property and equipment, and "materials and other inputs. " The input and output price indices are dual to the respective input and output quantity indices: total revenues from all services divided by the output index provides the output price index; total costs (including full costs of capital) divided by the input quantity index produces in input price index.

Author

Cost Analysis; Air Transportation; Airline Operations; Trends; Civil Aviation; Revenue; Productivity

19980018519 Hankuk Aviation Univ., Lecturer of Aviation Management, Kyunggido, Korea, Republic of

Korean Air Passengers' Choice Behaviour

Yoo, Kwang Eui, Hankuk Aviation Univ., Korea, Republic of; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 3, No. 2; 23p; In English, USA; Also announced as 19980018513; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

Domestic air travel is unusual in Korea because the country is not large enough to take advantage of air travel. International air travel was severely regulated by government until the late 1980's, and besides regulation, the common people in Korea have not been wealthy enough to take frequent international trips. In such conditions, Korean people in general have not been accustomed to taking an airplane until recently. Now, many Koreans can have the chance to take a trip abroad, because the regulation against "going out of country " has been greatly eased by the act of "liberalisation of foreign travel" in 1988, and even the common people have the economic ability to use international air travel. lt is therefore interesting as well as necessary to study particular people's behaviour in the relatively new situation of international air travel. This research will study the choice behaviour of Korean people for their international air trips. It will concentrate on the study of flight choice behaviour by Korean air travelers who are traveling long distance to North America or Western Europe flying more than 10 hours. As an initial study of the Korean international air travel market, the major objective of the research is to identify the factors and their importance for flight choice, and with these findings, relative importance between variables will be estimated (for example, the value of travel time). A disaggregate model will be more useful than an aggregate model to reach such objectives as described above. As a research method

to calibrate models, Stated Preference(SP) Techniques will be utilized. Often it is not easy to calibrate an efficient model with Revealed Preference(RP) data because there is not sufficient variation of all variables of interest and there are also often strong correlation between variables or between variables and other invisible factors. SP Techniques which allow the researcher to experiment, can offer a solution to these problems. With clearly defined attributes and attribute levels, SP experiments can give researchers the chance to have sufficient variation of variables interests, and an orthogonal design which ensures that the attributes presented to respondents are varied independently from one another, avoids multi-collinearity between attributes. The drawback of SP Techniques is that the data obtained represent individuals' statements of what they would do given hypothetical choices. However, people may not necessarily do what they say. This disadvantage can be overcome by presenting respondents with as realistic a set of situation as possible. Therefore, it is desirable that SP design and data gathering process should be devised according to the information obtained from RP data. So, it is necessary to have sufficient quality RF' data which will result reliable SP models. The necessary RP data was gathered through the survey of this study because there has not been any research related to international air travelers' behaviour in the market, until now. The survey to gather RF' data was conducted at passenger terminals of Kimpo International Airport in Seoul Korea, by distributing and collecting a self administered questionnaire. This paper will not present the detailed procedure of the survey and d data analysis. However, it was found that the surveyed RP data well represent the population (Yoo), and the findings from the data would be utilized for SP design as described in the section 11.
Derived from text

Korea; Air Transportation; Economics; Passengers; Surveys; Flight Characteristics

19980018520 Royal Inst. of Tech., Dept. of Infrastructure and Planning, Stockholm, Sweden

A Model for Air Passengers Choice of Flight and Booking Class: A Combined Stated Preference and Revealed Preference Approach

Algers, Staffan, Royal Inst. of Tech., Sweden; Beser, Muriel, Royal Inst. of Tech., Sweden; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 3, No. 2; 20p; In English; Also announced as 19980018513; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

Passenger demand varies, whereas aircraft capacity is fixed in the short term. This many times implies reject situations; the prospective passenger cannot book on his preferred flight and class. Once rejected the passenger can deviate to a competitor (or just stay home); alternatively he can book on another flight on the same airline; or he can buyup, then paying a higher fare in order to be accepted on the higher class. In 1994, Scandinavian Airlines System (SAS) took the initiative to a collaboration with the Royal Institute of Technology (KTH) concerning a project aiming at estimating deviation, recapture, and buyup; the estimates should be used for improving the class allocations in the airline's yield management systems. The KTH part of the project was to design and analyse Stated Preference (SP) experiments, and to support the field interviews for this. KTH also should model the choices of flight and booking class that were retrieved from booking process data supplied by SAS, then using the Revealed Preferences technique (RP). The two models were jointly applied to estimating buyup and recapture, and implied corrections of seat allocations were assessed. This paper describes the work that has been carried out and the results achieved, in terms of some models as well as suggestions for continued research. Interviews were made with a sample of passengers travelling on flight departures from airports A, B, and C on six routes during two weeks. Loggings of bookings from the reservations files for the same departures began about a month prior to the two week departure period. Since the project concerns a specific airline, and the information gathered might be strategic to competitors, some factors that were included in the analysis are not clearly defined; the geographic locations are not explicit, and the numerical results have been altered although in a way that will not influence the discussion in any principal way.
Derived from text

Passenger Aircraft; Passengers; Airline Operations; Commercial Aircraft; Estimating; Management Systems; Civil Aviation

19980018826 Oklahoma City Air Logistics Center, Tinker AFB, OK USA

Technical Test Plan for Aircraft 85-0085 Intermittent Power Failure Anomaly Flight ***Final Report***

Bradford, Jon C., Oklahoma City Air Logistics Center, USA; Jan. 09, 1997; 63p; In English
Report No.(s): AD-A332841; OC-ALC-TP-96-2113; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

B-1B aircraft 85-0085 arrived 29 Jul 96 for PDM. Aircraft experienced intermittent electrical failures during Functional Check Flight (FCF) on 27 Nov 96. Troubleshot defect and conducted Operational Check Flight (OCF) on 7 Dec 96. Intermittent failure reoccurred during flight. Extensive troubleshooting identified several defective electrical power components which feasibly could have caused the in-flight failure. These components were removed and replaced. Detailed troubleshooting background

is included. An OCF is scheduled for 10 Jan 97, weather permitting, with FCF to follow 11 Jan 97. After successful FCF, delivery is scheduled for 22 Jan 97.
DTIC
B-1 Aircraft; Failure; Flight Tests; Prevention; Maintenance

19980018985 Civil Aeromedical Inst., Protection and Survival Lab., Oklahoma City, OK USA
Inflatable Escape Slide Beam and Girt Strength Tests: Support for Revision of Technical Standard Order (TSO) C-69b ***Final Report***
McLean, Garnet A., Civil Aeromedical Inst., USA; Palmerton, David A., Civil Aeromedical Inst., USA; Chittum, Charles B., Civil Aeromedical Inst., USA; George, Mark H., Civil Aeromedical Inst., USA; Funkhouser, Gordon E., Civil Aeromedical Inst., USA; Feb. 1998; 22p; In English
Report No.(s): DOT/FAA/AM-98/3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The ability of inflatable escape slides to provide a safe egress route for evacuees in transport aircraft emergencies depends, to a great degree, on the structural integrity of such slides. Recent certification demonstration evacuations have demonstrated potential problems with the structural integrity of inflatable escape slides; specifically, the strength of the major structural elements of escape slides, i.e., the inflatable beams, has been questioned. With severe loading of the escape slides, the inflatable beams are known to bend, sometimes allowing the sliding surfaces between the beams to form cups that can impede the egress of evacuees by making it hard to climb out of the slide and onto firm footing. This study was intended to develop practical dynamic tests of inflatable beam strength that can be implemented during the developmental manufacturing process for escape slides to identify and correct inadequate inflatable beam strength. The result was the development of a practical test that uses sandbags to simulate human evacuees who are bunched together, toboggan style, during movement down the slide. The test provides data essentially equivalent to that obtained with human test subjects and also provides substantial benefits to human test subject safety. Additional tests of the structural integrity of the escape slide girt (attachment-to-the-aircraft) were also developed to standardize the test procedures for girt strength. Prior manufacturing tests had utilized 2 challenges: static loading of the girt attachment by sandbags laid along the erected slide surface and lateral loading of the girt by a 25-knot wind applied horizontally to the side of the erected escape slide. The new tests use both symmetrical and asymmetrical loading of the girt in a tensile test machine. These tests provide an enhanced ability to assess girt strength, especially as related to ease of execution and replicability of results.
Author
Chutes; Dynamic Tests; Safety; Static Loads; Tensile Tests; Structural Stability; Inflatable Structures

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

19980018215 European Organization for the Safety of Air Navigation, Experimental Centre, Bretigny-sur-Orge, France
Speech Recognition Experiments with the TRACON/Pro ATC Simulator, ***Feb. - May 1994***
Hering, H., European Organization for the Safety of Air Navigation, France; Feb. 1995; 52p; In English
Report No.(s): PB96-117338; EEC/NOTE-2/95; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This note presents findings of speech recognition experiments conducted at the Eurocontrol Experimental Centre using Wesson's TRACON/Pro ATC (Air Traffic Control) simulator. The built in Verbex Voice System is a continuous speech, speaker dependent, word based system. The results (e.g. mean overall recognition 81.2%) has to been seen under the aspect of the realistic, heavy workload of the subjects during the experiments.
NTIS
Air Traffic Control; Speech Recognition; Controllers

19980018290 Federal Aviation Administration, Technical Center, Atlantic City, NJ USA
National Simulation Capability (NSC) Reduced Vertical Separation Minima (RVSM) Phase 3 Result Report ***Final Report***
Seegar, Diena, Federal Aviation Administration, USA; Canaras, Stacy, Federal Aviation Administration, USA; Kopardekar, Parimal, Federal Aviation Administration, USA; Oct. 1997; 97p; In English
Report No.(s): AD-A331623; DOT/FAA/CT-TN97/9; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

The Reduced Vertical Separation Minima (RVSM) experiment resulted from the North Atlantic Systems Planning Group (NATSPG) conclusion to carry out studies aimed at achieving early implementation of RVSM in the North Atlantic Region.

RVSM is an approved International Civil Aviation Organization (ICAO) concept to reduce aircraft vertical separation from the Conventional Vertical Separation Minima (CVSM) of 2000 ft to 1000 ft, between flight level (FL) 290 and FL 410, within a designated portion of the North Atlantic Region. RVSM Phase 3 simulation studies were conducted in October 1995 at the Miami Air Route Traffic Control Center Dynamic Simulation Laboratory. The study investigated workload effects and the feasibility of transitioning aircraft to and from CVSM and from and to RVSM within radar sectors R1, R60, R62, and R63 under various traffic conditions. Generally, RVSM conditions proved to be more workload intensive than CVSM conditions. However, even though workload was increased, there was no corresponding increase in operational errors or deviations with RVSM when compared to CVSM. Both controller and Technical Observer ratings revealed that interval and post-run workload ratings were either equal or higher for RVSM under contingency/emergency (RVSM-E) conditions when compared to normal RVSM conditions. Analysis of operational errors revealed the same trend; more errors were reported during RVSM-E Therefore, guidelines to handle potential complications such as radar outages and bad weather need to be developed before RVSM can be safely implemented. The results of the simulation generally indicate that RVSM implementation is feasible in the Western Atlantic Track Route System region.
DTIC
Air Traffic Control; Civil Aviation; Meteorological Radar; Routes; Traffic; Workloads (Psychophysiology)

19980018800 Veda, Inc., Dayton, OH USA
Pilot-In-The-Loop Evaluation of the Approach Procedures Expert System (APES) ***Final Report, Apr. 1995 - Apr. 1996***
Toms, Mona L., Veda, Inc., USA; Cavallaro, Joseph J., Veda, Inc., USA; Conem, Scott M., Veda, Inc., USA; Moore, Frank W., Wright State Univ., USA; Gonzalez-Garcia, Airam, Wright Lab., USA; Jul. 30, 1997; 104p; In English
Contract(s)/Grant(s): F33615-93-D-3800; AF Proj. 2403
Report No.(s): AD-A333586; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The Vehicle-Pilot Integration Branch of Wright Laboratory(WL/FIGP) conducted a pilot-in-the-loop study to evaluate the utility of a prototype decision aid, the Approach Procedures Expert System (APES), to support the pilot's use of electronic approach plates in flying instrument approaches. This report describes the APES decision aid and the methodology and results of the Vehicle-Pilot Integration Branch's pilot-in-the-loop evaluation of the APES. The objectives of the study were to assess: (1) the effectiveness of APES for supporting approach tasks, (2) the performance of the decision aid and (3) the useability of the pilot-vehicle interface. to accomplish study objectives, 16 pilots flew a series of instrument approaches in a cockpit simulator. Pilot performance and subjective workload, situational awareness and acceptability ratings were obtained and analyzed to evaluate the study objectives. Overall, the results showed that the prototype Approach Procedure Expert System reduced pilot workload, increased pilot situational awareness, and improved flight performance compared to flying approaches without the decision aid. Refinements to the decision aid algorithm and pilot-vehicle interface were indicated. Potential areas for improvement of the APES and recommendations for further research are discussed.
DTIC
Expert Systems; Prototypes; Decision Support Systems; Instrument Approach; Pilot Performance; Flight Characteristics

19980018858 Transportation Systems Center, Cambridge, MA USA
Low-Cost ASDE Evaluation Report: Raytheon ASDE (Phase 2) Radar at MKE (M3625 / 18CPX-12) ***Final Report, Sep. 1996 - Mar. 1997***
Bandon, C., Transportation Systems Center, USA; Baker, K., Transportation Systems Center, USA; Blasier, J., Transportation Systems Center, USA; Bouchard, F., Transportation Systems Center, USA; Coyne, F., Transportation Systems Center, USA; Sep. 1997; 178p; In English
Report No.(s): AD-A331597; DOT-VNTSC-FAA-97-14; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The Federal Aviation Administration's (FAA) Runway incursion Reduction Program's Terminal Surveillance product Team has tasked the John A. Volpe National Transportation Systems Center to install and evaluate low cost Airport Surface Detection Equipment (ASDE) radar systems to aid air traffic controllers, during low visibility conditions, to detect surface radar targets and sequence aircraft movement on active runways. This document publishes test results of the Raytheon ASDE installed at Milwaukee's General Mitchell Airport. The low cost radars are being assessed for their ground surveillance potential for widespread use at smaller facilities. The report includes radar components and specifications, installation summary, functional and operational evaluations, system performance analysis, and recommendations. Test results show that, in low visibility conditions, the system enhanced controllers' situational awareness, detected and displayed targets, aided movement area clearance, and enabled controllers to confirm pilot's reported positions on the surface and their compliance with tower instructions. The ASDE's positive initial acceptance and low cost make it a sound option for small airports seeking effective ground surveillance radar.
DTIC
Airport Surface Detection Equipment; Air Traffic Controllers (Personnel); Runways; Reliability Analysis

19980019150 Draper (Charles Stark) Lab., Inc., Cambridge, MA USA

Evolutionary Concepts for Decentralized Air Traffic Flow Management

Adams, Milton, Draper (Charles Stark) Lab., Inc., USA; Kolitz, Stephan, Draper (Charles Stark) Lab., Inc., USA; Milner, Joseph, Washington Univ., USA; Odoni, Amedeo, Massachusetts Inst. of Tech., USA; Air Traffic Control Quarterly; 1997; ISSN 1064-3818; Volume 4, No. 4, pp. 281-306; In English

Contract(s)/Grant(s): NAG2-1088

Report No.(s): NASA/CR-97-207142; NAS 1.26:207142; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

Alternative concepts for modifying the policies and procedures under which the air traffic flow management system operates are described, and an approach to the evaluation of those concepts is discussed. Here, air traffic flow management includes all activities related to the management of the flow of aircraft and related system resources from 'block to block.' The alternative concepts represent stages in the evolution from the current system, in which air traffic management decision making is largely centralized within the FAA, to a more decentralized approach wherein the airlines and other airspace users collaborate in air traffic management decision making with the FAA. The emphasis in the discussion is on a viable medium-term partially decentralized scenario representing a phase of this evolution that is consistent with the decision-making approaches embodied in proposed Free Flight concepts for air traffic management. System-level metrics for analyzing and evaluating the various alternatives are defined, and a simulation testbed developed to generate values for those metrics is described. The fundamental issue of modeling airline behavior in decentralized environments is also raised, and an example of such a model, which deals with the preservation of flight bank integrity in hub airports, is presented.

Author

Air Traffic Control; Airline Operations; Management Systems; Policies; Alternatives; Flow Distribution; Decision Making; Commercial Aircraft

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

19980018117 NERAC, Inc., Tolland, CT USA

Stealth Aircraft Technology. (Latest Citations from the Aerospace Database)

Nov. 1995; In English; Page count unavailable.

Report No.(s): PB96-855598; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The bibliography contains citations concerning design, manufacture, and history of aircraft incorporating stealth technology. Citations focus on construction materials, testing, aircraft performance, and technology assessment. Fighter aircraft, bombers, missiles, and helicopters represent coverage. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Aircraft Construction Materials; Radar Absorbers

19980018125 NERAC, Inc., Tolland, CT USA

Aircraft Landing Brakes. (Latest Citations from the NTIS Bibliographic Database)

Nov. 1995; In English; Page count unavailable.

Report No.(s): PB96-855648; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, development, and applications of aircraft braking systems. Topics include a discussion of antiskid/antilocking braking systems, disc brakes, and properties of brakes and tires during braking and cornering of the aircraft. The effects of friction, wear, material composition, and weather conditions on the performance of aircraft braking systems are also presented. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Aircraft Landing; Brakes (For Arresting Motion); Aircraft Parts; Landing Gear

19980018137 Wright Lab., Flight Dynamics Directorate, Wright-Patterson AFB, OH USA

Conceptual and Preliminary Level Modeling of Wings Using the Adaptive Modeling Language ***Final Report, Sep. 1996 - Jun. 1997***

Bharatram, Geetha, Wright Lab., USA; Zweber, Jeffrey V., Wright Lab., USA; Jun. 1997; 32p; In English

Contract(s)/Grant(s): AF Proj. 2401

Report No.(s): AD-A333243; WL-TM-97-3070; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This memorandum demonstrates a methodology for an automated design process. The design process was developed in the Adaptive Modeling Language (AML). This effort concentrates on developing a system for linking conceptual level wing geometric parameters to a preliminary level finite element model. This environment allows for rapid changes in the geometric parameters of the wing planform (e.g., wing sweep, span, chord length, etc.) as well as the capability for updating internal substructure (i.e., number and placement of ribs, spars and stiffeners) in an integrated environment. In this effort, a fully associative geometric design model (developed in AML) is coupled with an aerospace structural optimization code, ASTROS.

DTIC

Computer Aided Design; Object-Oriented Programming; Swept Wings; Mathematical Models

19980018152 Army Research Lab., Hampton, VA USA

Wind-Tunnel Evaluation of the Effect of Blade Nonstructural Mass Distribution on Helicopter Fixed-System Loads

Wilbur, Matthew L., Army Research Lab., USA; Yeager, William T., Jr., Army Research Lab., USA; Singleton, Jeffrey D., Army Research Lab., USA; Mirick, Paul H., Army Research Lab., USA; Wilkie, W. Keats, Army Research Lab., USA; Jan. 1998; 250p; In English

Contract(s)/Grant(s): RTOP 505-63-36-02

Report No.(s): NASA/TM-1998-206281; NAS 1.15:206281; ARL-TR-1401; L-17353; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

This report provides data obtained during a wind-tunnel test conducted to investigate parametrically the effect of blade nonstructural mass on helicopter fixed-system vibratory loads. The data were obtained with aeroelastically scaled model rotor blades that allowed for the addition of concentrated nonstructural masses at multiple locations along the blade radius. Testing was conducted for advance ratios ranging from 0.10 to 0.35 for 10 blade-mass configurations. Three thrust levels were obtained at representative full-scale shaft angles for each blade-mass configuration. This report provides the fixed-system forces and moments measured during testing. The comprehensive database obtained is well-suited for use in correlation and development of advanced rotorcraft analyses.

Author

Helicopters; Shafts (Machine Elements); Rotary Wing Aircraft; Mass Distribution; Vibratory Loads; Wind Tunnel Tests

19980018188 Naval Postgraduate School, Monterey, CA USA

Analysis of Potential Structural Design Modifications for the Tail Section of the RAH-66 Comanche Helicopter

Tobin, Vincent M., Naval Postgraduate School, USA; Jun. 1997; 119p; In English

Report No.(s): AD-A333450; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The Army RAH-66 Comanche Helicopter made its first flight in January of 1996. Its current structural configuration, however does not meet the Army's requirements for radar signature. Structural configurations of the tailcone that meet radar cross-section requirements tend to lack sufficient structural stiffness due to the presence of Kevlar in place of graphite on the outer mold line. This thesis investigates potential structural design modifications to the Comanche tailcone that would move the design closer to meeting both its structural and radar signature requirements. Geometry modifications with baseline (current configuration) materials increased torsional stiffness by nine percent. Structural geometry modifications using radar signature compliant materials reduced torsional stiffness by 10 percent. The geometry changes analyzed produce structural performance improvements insufficient to allow the use of radar-compliant materials without further geometry changes.

DTIC

Radar Signatures; Torsion; Elastic Properties; Kevlar (Trademark)

19980018328 Federal Aviation Administration, Technical Center, Atlantic City, NJ USA

Proceedings of the FAA-NASA Symposium on the Continued Airworthiness of Aircraft Structures, Volume 1

Bigelow, Catherine A., Compiler, Federal Aviation Administration, USA; Jul. 1997; 330p; In English; FAA-NASA Symposium on the Continued Airworthiness of Aircraft Structures, 28-30 Aug. 1996, Atlanta, GA, USA

Report No.(s): AD-A331759; NASA/TM-97-206745; NAS 1.15:206745; DOT/FAA/AR-97/2-Vol-1; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

This publication contains the fifty-two technical papers presented at the FAA-NASA Symposium on the Continued Airworthiness of Aircraft Structures. The symposium, hosted by the FAA Center of Excellence for Computational Modeling of Aircraft Structures at Georgia Institute of Technology, was held to disseminate information on recent developments in advanced technologies to extend the life of high-time aircraft and design longer-life aircraft. Affiliations of the participants included 33% from government agencies and laboratories, 19% from academia, and 48% from industry; in all 240 people were in attendance. Technical papers were selected for presentation at the symposium, after a review of extended abstracts received by the Organizing Committee from a general call for papers.
DTIC
Conferences; Aircraft Reliability; Aircraft Structures; Evaluation

19980018329 Federal Aviation Administration, Technical Center, Atlantic City, NJ USA
Proceedings of the FAA-NASA Symposium on the Continued Airworthiness of Aircraft Structures, Volume 2
Bigelow, Catherine A., Compiler, Federal Aviation Administration, USA; Jul. 1997; 346p; In English; FAA-NASA Symposium on the Continued Airworthiness of Aircraft Structures, 28-30 Aug. 1996, Atlanta, GA, USA
Report No.(s): AD-A331760; NASA/TM-97-206744; NAS 1.15:206744; DOT/FAA/AR-97/2-Vol-2; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

This publication contains the fifty-two technical papers presented at the FAA-NASA Symposium on the Continued Airworthiness of Aircraft Structures. The symposium, hosted by the FAA Center of Excellence for Computational Modeling of Aircraft Structures at Georgia Institute of Technology, was held to disseminate information on recent developments in advanced technologies to extend the life of high-time aircraft and design longer-life aircraft. Affiliations of the participants included 33% from government agencies and laboratories, 19% from academia, and 48% from industry; in all 240 people were in attendance. Technical papers were selected for presentation at the symposium, after a review of extended abstracts received by the Organizing Committee from a general call for papers.
DTIC
Conferences; Aircraft Structures; Aircraft Reliability; Industries

19980018480 NASA Langley Research Center, Hampton, VA USA
The NASA Hyper-X Program
Freeman, Delman C., Jr., NASA Langley Research Center, USA; Reubush, Daivd E., NASA Langley Research Center, USA; McClinton, Charles R., NASA Langley Research Center, USA; Rausch, Vincent L., NASA Langley Research Center, USA; Crawford, J. Larry, NASA Dryden Flight Research Center, USA; 1997; 12p; In English; 48th; International Astronautical Congress, 6-10 Oct. 1997, Turin, Italy
Report No.(s): NASA/TM-1997-207243; NAS 1.15:207243; IAF-97-V-4.07; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper provides an overview of NASA's Hyper-X Program; a focused hypersonic technology effort designed to move hypersonic, airbreathing vehicle technology from the laboratory environment to the flight environment. This paper presents an overview of the flight test program, research objectives, approach, schedule and status. Substantial experimental database and concept validation have been completed. The program is currently concentrating on the first, Mach 7, vehicle development, verification and validation in preparation for wind-tunnel testing in 1998 and flight testing in 1999. Parallel to this effort the Mach 5 and 10 vehicle designs are being finalized. Detailed analytical and experimental evaluation of the Mach 7 vehicle at the flight conditions is nearing completion, and will provide a database for validation of design methods once flight test data are available.
Author
Technologies; Hypersonic Speed; Hypersonic Vehicles; Data Bases; Air Breathing Engines

19980018674 Dassault Aviation, Saint-Cloud, France
Vehicle Configurations and Aerothermodynamic Challenges *Configurations de Vehicules et Defis de la Conception Aerothermodynamique*
Perrier, P. C., Dassault Aviation, France; Hirschel, E. H., Daimler-Benz Aerospace A.G., Germany; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 16p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

Sustained hypersonic flight appears as a challenge for 3 classes of concepts quite different in their use: one is relative to constant cruise, the second to transient (but slowly varying) high altitude flight, the latter to low altitude penetration. For each of the concepts, a review will be presented of the more promising configurations and the associated aerothermodynamic challenges. In conclusion a proposal for a common technology program is given with demonstration filling the envelope of specifica-

tions and dealing with the critical points they generate. Slowly varying high altitude flights may be part of the mission of satellite launchers in the acceleration phase or in reentry cross range cruise with or without rebouncing effects. During these flights, convective ratio to radiative heat transfer is a driving parameter of vehicle configuration, associated with the search for better lift over drag ratio. Low altitude penetrators are specified by the high pressure generated and heavy flutter requirements. On the contrary, the search for configurations with relatively low drag and fuel consumption per mile, for a minimum structural weight, leads to configurations of pure cruisers to be at the pinpoint of aerodynamic efficiency only compromised by carry-and-release constraints.
Derived from text
High Altitude; Aerothermodynamics; Aerodynamic Characteristics; Convective Heat Transfer; Radiative Heat Transfer; Flight Altitude

19980018688 Daimler-Benz Aerospace A.G., Munich, Germany
Heat Loads in Hypersonic Vehicle Design
Hirschel, E. H., Daimler-Benz Aerospace A.G., Germany; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 10p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Heat load of hypersonic vehicles flying in the earth atmosphere at speeds below 8 km/s are considered. The general aspects are discussed, definitions are given. Surface-radiation cooling as the basic cooling mode is investigated, related peculiarities are explained. It is shown that heat loads are not only of interest for the materials and structure layout, but that strong couplings in both directions exist with the aerodynamic shape and the aerodynamic performance. The heat-loads oriented design as a perspective is discussed. Finally an overview over the status and the development needs of the prediction and verification capabilities is given.
Derived from text
Heat; Hypersonic Vehicles; Surface Cooling; Loads (Forces); Layouts

19980018689 Calspan-Buffalo Univ. Research Center, NY USA
Thermal Loads and Protection Systems for Transitional and Shock Interaction Regions in Hypersonic Vehicle Design
Holden, Michael S., Calspan-Buffalo Univ. Research Center, USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 10p; In English; Also announced as 19980018672
Contract(s)/Grant(s): SDIO84-93-C-0001; F49620-95-1-0292; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

In this paper, we discuss some of the more difficult to predict phenomena that control the sizing of thermal protection systems for sustained hypersonic flight, and the methods which are available to provide estimates of the requirements for backface, film-cooling and transpiration cooling techniques. The prediction of boundary layer transition on leading edges, in regions of pressure gradient, shock interaction and crossflow induced by vehicle incidence, represents key tasks in vehicle design. We review prediction methods that can be used to estimate the thermal loads when transition occurs. Film and transpiration cooling are two techniques that can be employed to flexibly handle the large and spatially-variable heating loads that can occur in shock interaction regions in and around airbreathing propulsion systems for hypersonic vehicles. Correlation of measurements made to assess the performance of these systems are presented to provide estimates of their effectiveness in constant pressure and shock interaction regions.
Derived from text
Film Cooling; Thermal Protection; Loads (Forces); Shock Wave Interaction; Boundary Layer Transition; Propulsion System Configurations; Prediction Analysis Techniques; Hypersonic Flight

19980018690 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. of Design Aerodynamics, Brunswick, Germany
Design of High L/D Vehicles Based on Hypersonic Waveriders
Eggers, Th., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Strohmeyer, D., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 10p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

The aerodynamic behavior of a waverider representing the hypersonic lower stage of a TSTO system is discussed. The investigation covers the complete speed range from subsonic high lift up to hypersonic flight close to the design point of the waverider geometries. Several interesting flow phenomena are described which govern the aerodynamic behavior. It is found that the favourable off-design behavior of hypersonic waveriders allows the practical use of waverider vehicles tar away from their particular design flow conditions. Studies concerning the planform show, that the modification of a gothic planform towards combined forebody - delta wing planforms allows a significant improvement of the aerodynamic efficiency L/D in sub- and transonic flow. In

addition the longitudinal stability is increased without compromising the favourable high speed qualities. These benefits are partly compensated by an increasing neutral point shift along the trajectory.
Derived from text
Lift Drag Ratio; Hypersonic Flight; Aerodynamic Configurations; Waveriders; Aerodynamic Characteristics; Transonic Flow

19980018695 Aerospatiale, Espace and Defense Branch, Les Mureaux, France
Flight Testing for Hypersonic Speeds: An European View
Laruelle, Gerard, Aerospatiale, France; Bonnefond, Thierry, Aerospatiale, France; Sacher, Peter, Daimler-Benz Aerospace A.G., Germany; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 6p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

The development of future vehicles with sustained hypersonic flight, using air-breathing and/or rocket propulsion, will require new knowledge and technologies which are not yet available and therefore not validated. One of the mandatory next steps before entering prototype work will be to perform flight tests in order to investigate the topics which can not be studied on ground. The present scenario in US (HyTech, X 33, X 34,...), Japan (Orex, Hyflex, Alflex,...) and Europe including Russia shows world-wide effort in exploring the need for flight testing advanced technologies flying at hypersonic speed. This need will be even more evident for future space launchers if reusability is required. In that case, this will mandatorily lead to a < step-by-step >> approach by flight testing technologies using appropriate flying test beds. Airbreathing propulsion is still, of course, most challenging due to the problems of engine/airframe integration and to the lack of flight data during engine operations at hypersonic speed. Even for fully reusable rocket propulsion, a lot of uncertainties must be still necessarily decreased before starting development of a future advanced transportation system.
Derived from text
Flight Tests; Hypersonic Speed; Air Breathing Engines; Reentry Vehicles; Propulsion; Hypersonic Flight; Launchers

19980018696 NASA Dryden Flight Research Center, Edwards, CA USA
NASA Hypersonic X-Plane Flight Development of Technologies and Capabilities for the 21st Century Access to Space
Hicks, John W., NASA Dryden Flight Research Center, USA; Trippensee, Gary, NASA Dryden Flight Research Center, USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 10p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

A new family of NASA experimental aircraft (X-planes) is being developed to uniquely, yet synergistically tackle a wide class of technologies to advance low-cost, efficient access to space for a range of payload classes. This family includes two non-air-breathing rocket-powered concepts, the X-33 and the X-34 aircraft, and two air-breathing vehicle concepts, the scramjet-powered Hyper-X and the rocket-based combined cycle flight vehicle. This report describes the NASA vision for reliable, reusable, fly-to-orbit spacecraft in relation to the current space shuttle capability. These hypersonic X-plane programs, their objectives, and their status are discussed. The respective technology sets and flight program approaches are compared and contrasted. Additionally, the synergy between these programs to advance the entire technology front in a uniform way is discussed. NASA's view of the value of in-flight hypersonic experimentation and technology development to act as the ultimate crucible for proving and accelerating technology readiness is provided. Finally, an opinion on end technology products and space access capabilities for the 21st century is offered.
Author
Hypersonic Flight; Research Aircraft; Technology Assessment; Reusable Spacecraft; Hypersonics; NASA Programs

19980018699 NASA Langley Research Center, Hampton, VA USA
Scramjet Engine/Airframe Integration Methodology
Hunt, James L., NASA Langley Research Center, USA; McClinton, Charles R., NASA Langley Research Center, USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 12p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

Scramjet engine/airframe integration methodology currently in use at the NASA Langley Research Center for design/analysis of hypersonic airbreathing vehicles is presented with illustrative example applications. The matrix encompasses engineering and higher order numerical methods that cover the major disciplines as well as a multidiscipline design/optimization approach.
Author
Engine Airframe Integration; Hypersonic Vehicles; Air Breathing Engines; Design Analysis

19980018700 Aerospatiale Missiles, Bourges, France

Air Intake and Air Intake / Combustion Interaction ***Entree D'Air et Integration Entree D'Air / Chambre de Combustion***

Auneau, Isabelle, Aerospatiale Missiles, France; Duveau, Philippe, Office National d'Etudes et de Recherches Aerospatiales, France; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 14p; In French; Also announced as 19980018672; Original contains color illustrations; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

High speed air-breathing vehicle studies (missiles, combines cycle engines single or two stage-to-orbit launchers) have been undertaken at AEROSPATIALE and ONERA for many years. The design of these vehicles requires the study of air intakes. The choice of the air intakes to be installed on a given vehicle is related to different considerations, among which the type of vehicle, its mission and expected performances, other constraints such as propulsive system integration, stealthiness,... The study of inlets can not be uncoupled from the design of other vehicle elements. Indeed, for hypersonic vehicles, the forebody usually acts as a pre-compression ramp and the scramjet injection struts take part of the internal compression process: both of these elements have to be taken into account at the very beginning of the inlet design, as well as flowfield requirements for combustion. For the supersonic vehicles using ramjets, though the forebody flowfield has less importance on the inlet design than for the hypersonic case, strong interactions exist between the inlet and the combustion chamber; and this, not only in terms of system performances, but also in terms of acceptable flowfield distortions for the combustion.

Author

Air Intakes; Combustion Chambers; Supersonic Combustion Ramjet Engines; Forebodies; Hypersonic Vehicles; Flow Distribution; Systems Integration; Hypersonics

19980018701 NASA Langley Research Center, Hampton, VA USA

Systems Challenges for Hypersonic Vehicles

Hunt, James L., NASA Langley Research Center, USA; Laruelle, Gerard, Societe Nationale Industrielle Aerospatiale, France; Wagner, Alain, Societe Nationale Industrielle Aerospatiale, France; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 18p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper examines the system challenges posed by fully reusable hypersonic cruise airplanes and access to space vehicles. Hydrocarbon and hydrogen fueled airplanes are considered with cruise speeds of Mach 5 and 10, respectively. The access to space matrix is examined. Airbreathing and rocket powered, single- and two-stage vehicles are considered. Reference vehicle architectures are presented. Major systems/subsystems challenges are described. Advanced, enhancing systems concepts as well as common system technologies are discussed.

Author

Air Breathing Engines; Hypersonic Vehicles; Hydrocarbons; Hypersonics; Systems Analysis

19980018702 Air Force Office of Scientific Research, Bolling AFB, Aerospace and Materials Sciences Directorate, Washington, DC USA

Scientific Barriers to Hypersonic Vehicle Design

Sakell, Leonidas, Air Force Office of Scientific Research, Bolling AFB, USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 6p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

This paper will discuss some of the scientific barriers to operational hypersonic vehicle design. These barriers arise from three primary sources. The first is a lack of fundamental understanding and knowledge of the aerothermodynamic flows, environments and, flow processes which arise over complex, 3D weapon system flight configurations during flight. The second source is the limitations inherent in the numerical simulations of these flows. The third is the lack of hypersonic test facilities which can operate with test times of at least seconds while also duplicating flight enthalpies and Reynolds numbers. My interest centers about the scientific issues arising with actual hypersonic configurations that are of current, planned or, potential mission relevance to the USA Air Force. I will discuss the major barriers in these categories below from the perspective of their impact on hypersonic flight vehicle design and performance.

Derived from text

Aerodynamic Configurations; Aerothermodynamics; Hypersonic Vehicles; Design Analysis; Systems Engineering; Test Facilities; Complex Systems

19980018704 NASA Langley Research Center, Hampton, VA USA

Multidisciplinary Optimization Methods for Preliminary Design

Korte, J. J., NASA Langley Research Center, USA; Weston, R. P., NASA Langley Research Center, USA; Zang, T. A., NASA

Langley Research Center, USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 10p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

An overview of multidisciplinary optimization (MDO) methodology and two applications of this methodology to the preliminary design phase are presented. These applications are being undertaken to improve, develop, validate and demonstrate MDO methods. Each is presented to illustrate different aspects of this methodology. The first application is an MDO preliminary design problem for defining the geometry and structure of an aerospike nozzle of a linear aerospike rocket engine. The second application demonstrates the use of the Framework for Interdisciplinary Design Optimization (FIDO), which is a computational environment system, by solving a preliminary design problem for a High-Speed Civil Transport (HSCT). The two sample problems illustrate the advantages to performing preliminary design with an MDO process.

Derived from text

Design Analysis; Optimization; Statistical Analysis; Aerospike Engines

19980019279 Massachusetts Inst. of Tech., Dept. of Aeronautics and Astronautics, Cambridge, MA USA

Prototype Conflict Alerting Logic for Free Flight

Yang, Lee C., Massachusetts Inst. of Tech., USA; Kuchar, James K., Massachusetts Inst. of Tech., USA; 1997; 12p; In English; 35th; Aerospace Sciences Meeting and Exhibit, 6-10 Jan. 1997, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): NASA/TM-97-207326; NAS 1.15:207326; AIAA Paper 97-0220; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper discusses the development of a prototype alerting system for a conceptual Free Flight environment. The concept assumes that datalink between aircraft is available and that conflicts are primarily resolved on the flight deck. Four alert stages are generated depending on the likelihood of a conflict. If the conflict is not resolved by the flight crews, Air Traffic Control is notified to take over separation authority. The alerting logic is based on probabilistic analysis through modeling of aircraft sensor and trajectory uncertainties. Monte Carlo simulations were used over a range of encounter situations to determine conflict probability. The four alert stages were then defined based on probability of conflict and on the number of avoidance maneuvers available to the flight crew. Preliminary results from numerical evaluations and from a piloted simulator study at NASA Ames Research Center are summarized.

Author

Air Traffic Control; Probability Theory; Free Flight; Warning Systems; Flight Crews

06
AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

19980018859 NASA Ames Research Center, Moffett Field, CA USA

Aiding Vertical Guidance Understanding

Feary, Michael, San Jose State Univ., USA; McCrobie, Daniel, Honeywell, Inc., USA; Alkin, Martin, Federal Express Corp., USA; Sherry, Lance, Honeywell, Inc., USA; Polson, Peter, Colorado Univ., USA; Palmer, Everett, NASA Ames Research Center, USA; McQuinn, Noreen, Boeing Co., USA; Feb. 1998; 84p; In English

Contract(s)/Grant(s): RTOP 548-40-12

Report No.(s): NASA/TM-1998-112217; A-98-09160; NAS 1.15:112217; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

A two-part study was conducted to evaluate modern flight deck automation and interfaces. In the first part, a survey was performed to validate the existence of automation surprises with current pilots. Results indicated that pilots were often surprised by the behavior of the automation. There were several surprises that were reported more frequently than others. An experimental study was then performed to evaluate (1) the reduction of automation surprises through training specifically for the vertical guidance logic, and (2) a new display that describes the flight guidance in terms of aircraft behaviors instead of control modes. The study was performed in a simulator that was used to run a complete flight with actual airline pilots. Three groups were used to evaluate the guidance display and training. In the training, condition, participants went through a training program for vertical guidance before flying the simulation. In the display condition, participants ran through the same training program and then flew the experimental scenario with the new Guidance-Flight Mode Annunciator (G-FMA). Results showed improved pilot performance when given training specifically for the vertical guidance logic and greater improvements when given the training and the new G-FMA. Using actual behavior of the avionics to design pilot training and FMA is feasible, and when the automated vertical

guidance mode of the Flight Management System is engaged, the display of the guidance mode and targets yields improved pilot performance.
Author
Flight Management Systems; Aircraft Control; Automation; Flight Simulation; Pilot Performance

07
AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft.

19980018033 Old Dominion Coll., Dept. of Mathematics and Statistics, Norfolk, VA USA
The Reduction of Ducted Fan Engine Noise Via A Boundary Integral Equation Method ***Final Report, Apr. 1996 - Apr. 1997***
Tweed, J., Old Dominion Coll., USA; Dunn, M., Old Dominion Coll., USA; Feb. 1997; 130p; In English
Contract(s)/Grant(s): NCC3-469
Report No.(s): NASA/CR-97-206991; NAS 1.26:206991; ODURF-136161; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The development of a Boundary Integral Equation Method (BIEM) for the prediction of ducted fan engine noise is discussed. The method is motivated by the need for an efficient and versatile computational tool to assist in parametric noise reduction studies. In this research, the work in reference 1 was extended to include passive noise control treatment on the duct interior. The BEM considers the scattering of incident sound generated by spinning point thrust dipoles in a uniform flow field by a thin cylindrical duct. The acoustic field is written as a superposition of spinning modes. Modal coefficients of acoustic pressure are calculated term by term. The BEM theoretical framework is based on Helmholtz potential theory. A boundary value problem is converted to a boundary integral equation formulation with unknown single and double layer densities on the duct wall. After solving for the unknown densities, the acoustic field is easily calculated. The main feature of the BIEM is the ability to compute any portion of the sound field without the need to compute the entire field. Other noise prediction methods such as CFD and Finite Element methods lack this property. Additional BIEM attributes include versatility, ease of use, rapid noise predictions, coupling of propagation and radiation both forward and aft, implementable on midrange personal computers, and valid over a wide range of frequencies.
Author
Engine Noise; Ducted Fan Engines; Boundary Integral Method; Noise Prediction; Noise Reduction

19980018675 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA
Hypersonic Air-Breathing Missile Propulsion
Waltrup, Paul J., Johns Hopkins Univ., USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 22p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

A comparison of the performance of storable, liquid hydrocarbon fueled, scramjet-powered axisymmetric missile configurations using several types of fuel piloting/ fuel pre-preparation methods are presented along with an initial methodology to permit these comparisons to be made. The merits of each engine type are discussed, and a first attempt at defining an upper flight Mach number bound on these types of engines is presented.
Author
Hypersonic Flight; Air Breathing Engines; Missile Configurations; Propulsion; Supersonic Combustion Ramjet Engines; Hydrocarbons

19980018676 Aerospatiale Missiles, Bourges, France
Scramjet and Dual Mode Ramjets
Bouchez, Marc, Aerospatiale Missiles, France; Falempin, Francois, Office National d'Etudes et de Recherches Aerospatiales, France; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 10p; In French; Also announced as 19980018672; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Airbreathing sustained hypersonic flight could have operational advantages for military applications. by an other way, airbreathing propulsion could have a potential interest for the future reusable launcher, in connection with rocket engines. High speed ramjets (scramjet and dual mode ramjet) are a key technology for these two kinds of military or space future applications. Airbreathing launcher using scramjet have been recently studied in France within the scope oi PREPHA program. The chosen concept, which seems to be the most power full and robust, is a dual mode ramjet, associated with rocket engines completely separated.

More generally, the use of scramjets for launchers is typically associated with hydrogen as a fuel, a maximum airbreathing Mach number of 12, and reusability. Less energetic fuels could also be used in dual fuel ramjets to take benefit of their higher density. Author

Supersonic Combustion Ramjet Engines; Ramjet Engines; Air Breathing Engines; Hypersonic Flight; Military Technology; Reusable Launch Vehicles; Rocket Engines

19980018677 Bayern-Chemie G.m.b.H., Aschau, Germany

Critical Physical Phenomena in Scramjet Propulsion

Kurth, G., Bayern-Chemie G.m.b.H., Germany; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 12p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper gives a short overview about the critical physical phenomena occurring in scramjet propulsion systems. After the description of these phenomena, an engineering approach will be given to analyze and predesign scramjet combustion processes and complete scramjet propulsion system respectively.

Derived from text

Supersonic Combustion Ramjet Engines; Propulsion System Performance; Propulsion System Configurations; Combustion Chambers; Physical Factors

19980018678 NASA Lewis Research Center, Cleveland, OH USA

Evaluation of an Ejector Ramjet Based Propulsion System for Air-Breathing Hypersonic Flight

Thomas, Scott R., NASA Lewis Research Center, USA; Perkins, H. Douglas, NASA Lewis Research Center, USA; Trefny, Charles J., NASA Lewis Research Center, USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 12p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

A Rocket Based Combined Cycle (RBCC) engine system is designed to combine the high thrust to weight ratio of a rocket along with the high specific impulse of a ramjet in a single, integrated propulsion system. This integrated, combined cycle propulsion system is designed to provide higher vehicle performance than that achievable with a separate rocket and ramjet. The RBCC engine system studied in the current program is the Aerojet strutjet engine concept, which is being developed jointly by a government-industry team as part of the Air Force HyTech program pre-PRDA activity. The strutjet is an ejector-ramjet engine in which small rocket chambers are embedded into the trailing edges of the inlet compression struts. The engine operates as an ejector-ramjet from takeoff to slightly above Mach 3. Above Mach 3 the engine operates as a ramjet and transitions to a scramjet at high Mach numbers. For space launch applications the rockets would be re-ignited at a Mach number or altitude beyond which air-breathing propulsion alone becomes impractical. The focus of the present study is to develop and demonstrate a strutjet flowpath using hydrocarbon fuel at up to Mach 7 conditions.

Author

Air Breathing Engines; Hypersonic Flight; Ejectors; Ramjet Engines; Propulsion; Rocket Engines; Hypersonic Speed; Engine Design; Cycles

19980018679 Office National d'Etudes et de Recherches Aerospatiales, Paris, France

Concept of a Combustion Chamber and the Injection Systems *Conception de la Chambre de Combustion et des Systemes D'injection*

Scherrer, D., Office National d'Etudes et de Recherches Aerospatiales, France; Bouchez, M., Aerospatiale, France; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 18p; In French; Also announced as 19980018672; Original contains color illustrations; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

The Conception of a combustion chamber and as system of injection of a hypersonic stator reactor are presented to cover three aspects: (1) Conception of the combustion chamber supplied with hydrogen and analysis of the method of functioning Mach 5 and 7.5; (2) Concepts of the injectors of a super stator reactor supplied with hydrogen; and (3) Specific problems posed by the use of hydrocarbon supplies.

Author

Injection; Hydrogen; Hypersonic Speed; Stators

19980018681 Motoren- und Turbinen-Union G.m.b.H., Munich, Germany

Active Cooling of Fully Variable Hypersonic SERN Nozzles

Lederer, R., Motoren- und Turbinen-Union G.m.b.H., Germany; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 6p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Within the last few years MTU has made a great development effort towards high-speed nozzle design, manufacturing, hot-gas testing and test analysis as part of the German Hypersonics Technology Programme. Within the framework of this programme two actively cooled nozzles were designed, fabricated and tested in 1993 and 1995, respectively. Whereas the first nozzle was cooled with cryogenic hydrogen, gaseous hydrogen was used for the latter. In this paper the associated nozzle design, fabrication and test effort will be described and highlighted. Focus will be placed on the experience gained by testing the actively cooled, fully variable nozzle structures.
Author
Hypersonic Nozzles; Nozzle Design; Fabrication; Hydrogen; High Temperature Gases; Cryogenics

19980018691 Office National d'Etudes et de Recherches Aerospatiales, Paris, France
Test Facilities for Basic Research on Propulsion ***Installations D'Essais Pour les Recherches Fondamentales en Propulsion***
Collin, G., Office National d'Etudes et de Recherches Aerospatiales, France; Dessornes, O., Office National d'Etudes et de Recherches Aerospatiales, France; Magre, P., Office National d'Etudes et de Recherches Aerospatiales, France; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 12p; Summary translated by Schreiber; In French; Also announced as 19980018672; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

Two test facilities for hydrogen combustion in supersonic air flow were developed in the context of studies on superathodyds [ramjet]. One is dedicated to basic studies of reactive supersonic mixture layers; the other one deals with the evaluation of concepts of injection and of combustion chamber. These facilities and the related instruments are described. Initial results demonstrate their capacity to produce supersonic combustion flows and to supply data on the inflammation time and on the elementary injectors.
Derived from text
Combustible Flow; Hydrogen; Supersonic Flow; Combustion Chambers; Test Facilities; Ramjet Engines

19980018697 Pyrodyne, Inc., New Market, MD USA
Overview of Propulsion Performance
Billig, Frederick S., Pyrodyne, Inc., USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 12p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

Nearly forty years have passed since the concept of the supersonic combustion ramjet, scramjet, was first introduced. At that time, the exciting potential of airbreathing propulsion for both expendable missiles and highly efficient space launch systems were proposed. Conceptual vehicle designs, engine flowpaths, including methods for injection and flame stabilization, and estimates of cycle performance were developed. Calculations were made for typical climb and cruise trajectories which showed distinct advantages of the scramjet over all-rocket powered systems. In the intervening years, prior to the initiation of the National Aero-Space Plane (NASP), a significant technology data base had been established which had substantiated the levels of performance that had been predicted by the pioneers. Nonetheless, no system utilizing the scramjet propulsion system had been developed. On every occasion, when a selection between a scramjet and an all-rocket system had been made, the all-rocket has prevailed. Paradoxically, the NASP, which was to be a single stage access to orbit vehicle, never was required to consider an all-rocket-powered alternative. Unfortunately, NASP failed to meet its stated objectives, in part due to unforeseen limitations of the propulsion cycle, and the program was cancelled. It is prudent to examine the underlying reasons for both the decision to cancel NASP and the reluctance to select scramjets for other applications.
Derived from text
Propulsion; Supersonic Combustion Ramjet Engines; National Aerospace Plane Program; Air Breathing Engines; Spacecraft Launching; Rocket Engines

19980018832 Central Inst. of Aviation Motors, Moscow, Russia
The Possibility Investigation of Strut Fuel Feed System Use in Scramjet Combustors on Results of Tests with Hydrocarbon Fuel ***Final Report***
Semenov, V. L., Central Inst. of Aviation Motors, Russia; Jan. 1997; 26p; In English
Contract(s)/Grant(s): F61708-96-W0221
Report No.(s): AD-A332687; TR-4; EOARD-SPC96-4042; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The presented final report contains the summary of the results of three previous stages of serviceability investigation of strut fuel feed system intended to inject fuel into supersonic high-enthalpy flow of two-dimensional small-scale model scramjet combustor. The results of the fourth stage of the work on EOARD Order No F6170896W0221 are presented in section concerning fuel strut thermal state in free supersonic flow investigation. This strut is designed, manufactured and tested in accordance with modeling concept and studies methodology taking into account results of the first three stages. The strut is intended for the following bench investigations of combustion and heat exchange problems in duct of combustor burning hydrocarbon fuels of various

types, injected chiefly in gaseous phase. This strut dimensions differ from dimensions of earlier tested struts. They correspond to the scale of scramjet module for flying test beds of the second generation of 'IGLA' type. The final section of the report incorporates the results generalization of model studies of combustor operating process and fuel struts cooling system and the recommendations on these results use in the cases that combustor of different sizes burning different types of fuels operates.
DTIC
Fuel Systems; Hydrocarbon Fuels; Combustion; Supersonic Combustion Ramjet Engines; Struts; Feed Systems; Supersonic Flow; Heat of Combustion

19980018939 Mitre Corp., JASON Program Office, McLean, VA USA
Nanoflyer
Katz, J., Mitre Corp., USA; Garwin, R., Mitre Corp., USA; Press, W., Mitre Corp., USA; Oct. 13, 1997; 12p; In English
Report No.(s): AD-A331791; JSR-97-115; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A recent proposal to use electrostatic forces to lift and propel a small airborne vehicle is examined. We show here that although this is permitted by the laws of physics, it is very inefficient, and is limited to low areal loads by the requirement to avoid electric breakdown. Electrostatic propulsion offers no special advantages which might justify the price of its inefficiency.
DTIC
Aircraft; Electrostatic Propulsion; Loads (Forces); Lift; Aircraft Reliability

08
AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

19980018275 NASA Dryden Flight Research Center, Edwards, CA USA
Choosing Sensor Configuration for a Flexible Structure Using Full Control Synthesis
Lind, Rick, NASA Dryden Flight Research Center, USA; Nalbantoglu, Volkan, Minnesota Univ., USA; Balas, Gary, Minnesota Univ., USA; 1997; 11p; In English; Guidance, Navigation and Control Conference, Aug. 1997, New Orleans, LA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Sponsored in part by the University of Minnesota McKnight Land Grand Professorship
Contract(s)/Grant(s): N60530-91-C-0218; NAG1-821; NSF ECS-91-20354; JHU-BPO-2229
Report No.(s): NASA/CR-97-207067; NAS 1.26:207067; AIAA Paper 97-3745; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Optimal locations and types for feedback sensors which meet design constraints and control requirements are difficult to determine. This paper introduces an approach to choosing a sensor configuration based on Full Control synthesis. A globally optimal Full Control compensator is computed for each member of a set of sensor configurations which are feasible for the plant. The sensor configuration associated with the Full Control system achieving the best closed-loop performance is chosen for feedback measurements to an output feedback controller. A flexible structure is used as an example to demonstrate this procedure. Experimental results show sensor configurations chosen to optimize the Full Control performance are effective for output feedback controllers.
Author
Design Analysis; Feedback Control; Controllers; Measuring Instruments; Configuration Management

19980018481 NASA Dryden Flight Research Center, Edwards, CA USA
Improved Flight Test Procedures for Flutter Clearance
Lind, Rick C., NASA Dryden Flight Research Center, USA; Brenner, Martin J., NASA Dryden Flight Research Center, USA; Freudinger, Lawrence C., NASA Dryden Flight Research Center, USA; 1997; 8p; In English
Contract(s)/Grant(s): NAS4-97010
Report No.(s): NASA/CR-97-207068; NAS 1.26:207068; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Flight flutter testing is an integral part of flight envelope clearance. This paper discusses advancements in several areas that are being investigated to improve efficiency and safety of flight test programs. Results are presented from recent flight testing of the F/A-18 Systems Research Aircraft. A wingtip excitation system was used to generate aeroelastic response data. This system worked well for many flight conditions but still displayed some anomalies. Wavelet processing is used to analyze the flight data. Filtered transfer functions are generated that greatly improve system identification. A flutter margin is formulated that accounts for errors between a model and flight data. Worst-case flutter margins are computed to demonstrate the flutter boundary may lie

closer to the flight envelope than previously estimated. This paper concludes with developments for a distributed flight analysis environment and on-line health monitoring.
Author
Flight Tests; Flutter; Flight Envelopes; Research Aircraft; Clearances; Environmental Monitoring; Aeroelasticity; Dynamic Response

19980018482 NASA Dryden Flight Research Center, Edwards, CA USA
Correlation Filtering of Modal Dynamics using the Laplace Wavelet
Freudinger, Lawrence C., NASA Dryden Flight Research Center, USA; Lind, Rick, NASA Dryden Flight Research Center, USA; Brenner, Martin J., NASA Dryden Flight Research Center, USA; Apr. 1997; 10p; In English
Contract(s)/Grant(s): NCC4-111
Report No.(s): NASA/CR-97-207066; NAS 1.26:207066; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Wavelet analysis allows processing of transient response data commonly encountered in vibration health monitoring tasks such as aircraft flutter testing. The Laplace wavelet is formulated as an impulse response of a single mode system to be similar to data features commonly encountered in these health monitoring tasks. A correlation filtering approach is introduced using the Laplace wavelet to decompose a signal into impulse responses of single mode subsystems. Applications using responses from flutter testing of aeroelastic systems demonstrate modal parameters and stability estimates can be estimated by correlation filtering free decay data with a set of Laplace wavelets.
Author
Wavelet Analysis; Systems Health Monitoring; Flutter; Correlation; Algorithms

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands.

19980018077 NERAC, Inc., Tolland, CT USA
Anechoic Chambers: Aerospace Applications. (Latest Citations from the Aerospace Database)
Nov. 1995; In English; Page count unavailable.
Report No.(s): PB96-855689; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The bibliography contains citations concerning the design, development, performance, and applications of anechoic chambers in the aerospace industry. Anechoic chamber testing equipment, techniques for evaluation of aerodynamic noise, microwave and radio antennas, and other acoustic measurement devices are considered. Shock wave studies on aircraft models and components, electromagnetic measurements, jet flow studies, and antenna radiation pattern measurements for industrial and military aerospace equipment are discussed. (Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Bibliographies; Anechoic Chambers; Antennas; Aerodynamic Noise; Acoustic Measurement; Aeroacoustics

19980018332 Naval Postgraduate School, Monterey, CA USA
Modeling and Analysis of Helicopter Ground Resonance Utilizing Symbolic Processing and Dynamic Simulation Software
Robinson, Christopher S., Naval Postgraduate School, USA; Mar. 1997; 137p; In English
Report No.(s): AD-A331773; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This thesis develops a technique for formulating the full nonlinear equations of motion for a coupled rotor-fuselage system utilizing the symbolic processing software MAPLE(registered). The symbolic software is further utilized to automatically convert the equations of motion into C, FORTRAN or MATLAB(registered) source code formatted specifically for numerical integration. The compiled source code can be accessed and numerically integrated by the dynamic simulation software SIMULINK(registered). SIMULINK(registered) is utilized to generate time history plots of blade and fuselage motion. These time traces can be used to explore the effects of damping nonlinearities, structural nonlinearities, active control, individual blade control, and damper failure on ground resonance. In addition, a MATLAB(registered) program was developed to apply the Moving Block Technique for determining modal damping of the rotor-fuselage system from the time marching solutions.
DTIC
Aircraft Models; Ground Resonance; Computerized Simulation; Nonlinear Equations; Helicopter Tail Rotors

19980018683 NASA Ames Research Center, Moffett Field, CA USA

Survey of Aerothermodynamics Facilities Useful for the Design of Hypersonic Vehicles Using Air-Breathing Propulsion

Arnold, James O., NASA Ames Research Center, USA; Deiwert, George S., NASA Ames Research Center, USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 16p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper surveys the use of aerothermodynamic facilities which have been useful in the study of external flows and propulsion aspects of hypersonic, air-breathing vehicles. While the paper is not a survey of all facilities, it covers the utility of shock tunnels and conventional hypersonic blow-down facilities which have been used for hypersonic air-breather studies. The problems confronting researchers in the field of aerothermodynamics are outlined. Results from the T5 GALCIT tunnel for the shock-on lip problem are outlined. Experiments on combustors and short expansion nozzles using the semi-free jet method have been conducted in large shock tunnels. An example which employed the NASA Ames 16-Inch shock tunnel is outlined, and the philosophy of the test technique is described. Conventional blow-down hypersonic wind tunnels are quite useful in hypersonic air-breathing studies. Results from an expansion ramp experiment, simulating the nozzle on a hypersonic air-breather from the NASA Ames 3.5 Foot Hypersonic wind tunnel are summarized. Similar work on expansion nozzles conducted in the NASA Langley hypersonic wind tunnel complex is cited. Free-jet air-frame propulsion integration and configuration stability experiments conducted at Langley in the hypersonic wind tunnel complex on a small generic model are also summarized.
Derived from text

Aerothermodynamics; Air Breathing Engines; Hypersonic Vehicles; Hypersonic Wind Tunnels; Shock Tunnels; Surveys

19980018692 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Lampoldshausen, Germany

Test Facilities for Large Ramjets

Koschel, W. W., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Heitmeier, F., Daimler-Benz Aerospace A.G., Germany; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 10p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Within the German Hypersonics Technology Program (GHTP) a subscale ramjet was to be ground tested in a free jet configuration. The propulsion system selection process for a hypersonic experimental flight vehicle will be briefly reviewed. A ramjet type propulsion system with subsonic combustion was chosen as the baseline configuration. The rationale of technology and component development will be presented. The final goal of the program was a ramjet test in the simulated flight Mach number range from Ma = 3.5 up to Ma = 6.8 in order to demonstrate the engine's steady state operation and thrust capability. A general concept for the ramjet ground testing was developed specifying as well the operational requirements for the engine characteristics as the test and measurement plan. A ramjet propulsion system with a ram combustor diameter of 500 mm was designed as the demonstrator engine. Based on the predefined specifications an evaluation of existing large scale test facilities was made including a total of 11 existing facilities in the USA, in Russia and in France. Engine installation and necessary adaptation of existing hardware were studied and discussed with the operators in detail. Major results of this facility evaluation study and lessons learned will be presented in the paper. The APTU wind tunnel of the AEDC at Tullahoma was finally selected for the planned tests of the full engine. Due to funding restrictions only the ram combustor with the variable geometry nozzle could be demonstrated in operation in the connected-pipe test facility at Ottobbrunn in Germany.
Derived from text

Ramjet Engines; Hypersonic Vehicles; Propulsion System Configurations; Test Facilities; Free Jets; Hypersonics

19980018694 NASA Langley Research Center, Hampton, VA USA

NASA and ESA Ground Facility Simulations of Shuttle Orbiter Aerothermodynamics

Muylaert, J., European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands; Rostand, P., Dassault Aviation, France; Rapuc, M., Dassault Aviation, France; Paulson, J., NASA Langley Research Center, USA; Brauckmann, G., NASA Langley Research Center, USA; Trockmorton, D., NASA Langley Research Center, USA; Steijl, R., Technische Univ., Netherlands; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 16p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

The paper reviews a combined numerical and experimental activity on the Shuttle Orbiter, first performed at NASA Langley within the OEX workshop and subsequently at ESA, as part of the AGARD FDP WG 18 activities. The study at Langley was undertaken to resolve the pitch up anomaly observed during the entry of the first flight of the Shuttle Orbiter. The facilities used at NASA Langley were the 15-in. Mach 6, the 20-in, Mach 6, the 31-in. Mach 10 and the 20-in. Mach 6 CF4 facility. The paper focuses on the high Mach, high altitude portion of the first entry of the Shuttle where the vehicle exhibited a nose-up pitching moment relative to pre-flight prediction of (Delta C(sub m)) = 0 03. In order to study the relative contribution of compressibility, viscous interaction and real gas effects on basic body pitching moment and flap efficiency, an experimental study was undertaken

to examine the effects of Mach, Reynolds and ratio of specific heats at NASA. At high Mach, a decrease of gamma occurs in the shock layer due to high temperature effects. The primary effect of this lower specific heat ratio is a decrease of the pressure on the aft windward expansion surface of the Orbiter causing the nose-up pitching moment. Testing in the heavy gas, Mach 6 CF4 tunnel, gave a good simulation of high temperature effects.
Author
Space Shuttle Orbiters; Aerothermodynamics; Mach Number; European Space Agency; NASA Programs

19980018787 National Inst. of Standards and Technology, National Voluntary Lab. Accreditation Program, Gaithersburg, MD USA
Airborne Asbestos Analysis: National Voluntary Laboratory Accreditation Program
Turner, S., National Inst. of Standards and Technology, USA; Steel, E. B., National Inst. of Standards and Technology, USA; Alderman, D. F., National Inst. of Standards and Technology, USA; Oct. 1995; 83p; In English
Report No.(s): PB96-147392; NIST/HB-150-13; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Any laboratory (including commercial, manufacturer, university, or federal, state, or local government laboratory) that performs the test method that comprises the Airborne Asbestos Analysis Program many apply for National Voluntary Laboratory Accreditation Program (NVLAP) accreditation. Accreditation will be granted to a laboratory that satisfactorily fulfills the conditions for accreditation defined in NIST Handbook 150, NVLAP Procedures and General Requirements, which contain Title 15, Part 285 of the Code of Federal Regulations. These conditions include satisfactory performance in selected proficiency testing as required, and fulfilling the on-site assessment requirements, including resolution of identified deficiencies. The names of NVLAP-accredited laboratories are published in the NVLAP annual directory and other media to which information is regularly provided.
NTIS
Asbestos; Air Pollution; Handbooks

10
ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; space communications, spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

19980018680 Phillips Lab., Edwards AFB, CA USA
Rocket Ramjet Boosters for Sustained High Speed Flight
DeGeorge, Drew, Phillips Lab., USA; Hewitt, Pat, Atlantic Research Corp., USA; Siebenhaar, Adam, GenCorp Aerojet, USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 10p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Sustained high speed flight requires the highest levels of propulsive and aerodynamic performance. One of the highest performance classes of propulsion system envisioned is the air augmented rocket. The potential for significant Imp increases to be gained using an air augmented rocket (with either liquid, solid or hybrid propellant boost propulsion systems) has long been recognized. Using intake air as the primary oxidizer with rocket fuel significantly reduces on-board propellant mass, vehicle mass and volume for the same total impulse delivered compared to conventional chemical rockets. The list of technical challenges for viability and use include: (1) Booster configuration including integrated (boost propellant inside air-augmented combustion chamber, with or without a typical rocket nozzle), parallel or tandem boosters, and propellant combination drives booster complexity, need for ejecta, boost system ballistic requirements, air-augmented rocket performance and vehicle aerodynamics; (2) Complexity of starting flow through the inlets and initiating efficient air-augmented ignition; and (3) Aerodynamics involved in starting and unstarting inlets in supersonic flow while performing high angle of attack maneuvers can negatively impact missile performance.
Derived from text
Rocket Engines; Aerodynamic Characteristics; Booster Rocket Engines; Propulsion System Configurations; Propulsion System Performance; Hybrid Propellants; Propellant Combustion; Supersonic Flow; High Speed

19980019293 John Carroll Univ., Dept. of Physics, Cleveland, OH USA
Optical Sensors for Use in Propulsion Control Systems ***Final Report, 1 Jan. 1984 - 16 Mar. 1995***
Fritsch, Klaus, John Carroll Univ., USA; Dec. 08, 1997; 18p; In English
Contract(s)/Grant(s): NAG3-571

Report No.(s): NASA/CR-95-206752; NAS 1.26:206752; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This final technical report describes the results of a cooperative effort which was originally established between John Carroll University and the Instrumentation and Control Technology Division at NASA Lewis Research Center on November, 1982, and then continued with the Engine Sensor Technology Branch at NASA Lewis until March, 1995. All work at John Carroll University was directed by the principal investigator of this grant, Klaus Fritsch, Ph.D. For the first two years of this grant this effort was supervised at NASA by Mr. Robert J. Baumbick and for the remainder of the grant by Dr. Glenn M. Beheim. All research was carried out in close cooperation with Dr. Beheim. Electrically passive optical sensors for measurands such as pressure, temperature, position, and rotational speed are required for aircraft engine control in fly-by-light digital aircraft control systems. Fiberoptic data links and optical multiplexing techniques should be used for combining and processing the outputs from several sensors, sharing as many optical end electronic parts as possible. The overall objective of this grant was to explore techniques for designing and constructing such electrically passive optical sensors for measuring physical parameters in jet aircraft engines and for use in aircraft control systems. We have concentrated our efforts on pressure, temperature, and position sensors employing techniques which are relatively immune to transmissivity variations of the fiber links and to variations in intensity of the light source. Infrared light-emitting diodes are employed because of their longevity and immunity to vibration. We have also studied a number of multiplexing techniques. On the following pages I will give thumbnail sketches of the projects carried out under this grant and provide references to publications and John Carroll M.S. theses which resulted directly from this work and which describe these projects in greater detail.

Derived from text

Aircraft Engines; Engine Control; Fly by Light Control; Optical Measuring Instruments; Aircraft Control; Digital Systems; Jet Aircraft; Data Links

11
CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; propellants and fuels; and materials processing.

19980018703 Aerospatiale, Espace et Defense Branch, Cannes, France

Lightweight Materials for Engines and Structures

Capdepuy, B., Aerospatiale, France; Peres, P., Aerospatiale, France; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 6p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Hypersonic flight constitutes for materials developers a big challenge considering the requirements they have to be compliant with. The mastering of this key technology is necessary to design hypersonic vehicle as they are needed to realize the thermal protection system as well as some parts of engines. The requirements can be identified ranking in three categories which are technical, industrial feasibility and producing costs. These three topics will be discussed in this paper. For the thermal protection system of reentry vehicles, carbon/carbon composites protected against oxidation as well as carbon/silicon carbide composites have already demonstrate they are good candidates to sustain high thermomechanical loads. But in order to be compliant with development costs of future system an effort has to be performed in simplified designs. For future engines as scramjet requirements are much more severe but a first demonstration of applicability of such materials has been performed on an injection strut. Nevertheless the demonstration of behaviour of the coatings to combustion ambiances has yet to be demonstrated for long term and reusable applications.

Author

Hypersonic Flight; Carbon-Carbon Composites; Thermal Protection; Costs; Elastic Properties; Reentry Vehicles; Silicon Carbides; Hypersonic Vehicles

19980018705 Alenia Spazio S.p.A., Turin, Italy

Integrated Hydrogen Fuel Management as Heat Sink for Active Cooling in Advanced Hypersonic Aircraft

Denaro, A., Alenia Spazio S.p.A., Italy; Audrito, G., Alenia Spazio S.p.A., Italy; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 3; 8p; In English; Also announced as 19980018672; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Cooling potentialities of hydrogen fuel to manage the heat dissipations of internal equipment are explored and integrated with the complete Thermal Control System of a reference hypersonic vehicle. Nominal performances are investigated during all a mission phase and drivers are provided for the optimization of the Regenerative Cooling.
Derived from text
Cooling; Management Systems; Hydrogen Fuels; Hypersonic Aircraft; Regenerative Cooling; Hypersonic Vehicles

19980018936 Sandia National Labs., Albuquerque, NM USA
Results from FAA program to validate bonded composite doublers for commercial aviation use
Roach, D. P., Sandia National Labs., USA; 1997; 12p; In English; SAE Airframe Maintenance and Repair Conference, 5-7 Aug. 1997, Vancouver, Canada
Contract(s)/Grant(s): DE-AC04-94AL-85000; DTFA03-95-X-9002
Report No.(s): SAND-97-1385C; CONF-970880-1; DE97-006836; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The number of commercial airframes exceeding twenty years of service continues to grow. In addition, Service Life Extension Programs are attempting to extend the ”economic” service life of commercial airframes to thirty years. The use of bonded composites may offer the airframe manufacturers and aircraft maintenance facilities a cost effective method to extend the lives of their aircraft. The Federal Aviation Administration Assurance NDI Validation Center (AANC) to validate the use of bonded composite doublers on commercial aircraft.
DOE
Aircraft Structures; Airframes; Commercial Aircraft; Composite Materials; Airline Operations

12
ENGINEERING

Includes engineering (general); communications and radar; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.

19980018336 General Accounting Office, National Security and International Affairs Div., Washington, DC USA
Apache Longbow Helicopter: Fire Control Radar Not Ready for Multiyear Procurement
Nov. 17, 1997; 10p; In English
Report No.(s): AD-A331626; GAO/NSIAD-98-11; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Longbow is a modification of the Apache helicopter that consists of an upgraded airframe, a newly developed radar, and the Longbow Hellfire missile. The Apache Longbow is designed to conduct precision attacks in adverse weather conditions, automatically engage multiple targets, provide fire and forget missile capability, and operate on the digital battlefield of the future. The radar, the key component of the Longbow, is designed to provide the helicopter with the capability to automatically detect, classify, and prioritize targets. In 1991, the Army planned to develop and procure 227 Longbow Apache helicopters. In May 1993, the program was restructured to upgrade the entire fleet of 758 helicopters to the Apache Longbow configuration but outfit only 227 with the fire control radar and a more powerful 701C engine. Full rate production of both the Apache Longbow airframe and fire control radar was authorized in October 1995. The first contract for 10 fire control radars was awarded in March 1993, and the second contract was finalized in January 1997 for an additional 11 radars. The Army plans to award a multiyear contract for the fire control radar in December 1997.
DTIC
Air to Air Missiles; Air to Surface Missiles; Fire Control; Helicopters; Missiles

19980018473 NASA Ames Research Center, Moffett Field, CA USA
Improving the Performance of Two-Stage Gas Guns by Adding a Diaphragm in the Pump Tube
Bogdanoff, D. W., Thermoscience Inst., USA; Miller, Robert J., NASA Ames Research Center, USA; International Journal of Impact Engineering; 1995; ISSN 0734-743X; Volume 17, pp. 81-92; In English
Contract(s)/Grant(s): NAS2-14031
Report No.(s): NASA/CR-95-207229; NAS 1.26:207229; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Herein, we study the technique of improving the gun performance by installing a diaphragm in the pump tube of the gun. A CFD study is carried out for the 0.28 in. gun in the Hypervelocity Free Flight Radiation (HFF RAD) range at the NASA Ames Research Center. The normal, full-length pump tube is studied as well as two pump tubes of reduced length (approximately 75%

and approximately 33% of the normal length). Significant improvements in performance are calculated to be gained for the reduced length pump tubes upon the addition of the diaphragm. These improvements are identified as reductions in maximum pressures in the pump tube and at the projectile base of approximately 20%, while maintaining the projectile muzzle velocity or as increases in muzzle velocity of approximately 0.5 km/sec while not increasing the maximum pressures in the gun. Also, it is found that both guns with reduced pump tube length (with diaphragms) could maintain the performance of gun with the full length pump tube without diaphragms, whereas the guns with reduced pump tube lengths without diaphragms could not. A five-shot experimental investigation of the pump tube diaphragm technique is carried out for the gun with a pump tube length of 75% normal. The CFD predictions of increased muzzle velocity are borne out by the experimental data. Modest, but useful muzzle velocity increases (2.5 - 6%) are obtained upon the installation of a diaphragm, compared to a benchmark shot without a diaphragm.
Author
Free Flight; Gas Guns; Hypersonic Flight

19980019012 NASA Langley Research Center, Hampton, VA USA
Manuel Stein's Five Decades of Structural Mechanics Contributions (1944-1988)
Mikulas, Martin M., Colorado Univ., USA; Card, Michael F., Eagle Engineering, Inc., USA; Peterson, Jim P., NASA Langley Research Center, USA; Starnes, James H., Jr., NASA Langley Research Center, USA; Stability Analysis of Plates and Shells; Jan. 1998, pp. 1-8; In English; Also announced as 19980019011
Report No.(s): AIAA Paper 97-1073; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A04, Microfiche

Manuel Stein went to work for NACA (National Advisory Committee for Aeronautics) in 1944 and left in 1988. His research contributions spanned five decades of extremely defining times for the aerospace industry. Problems arising from the analysis and design of efficient thin plate and shell aerospace structures have stimulated research over the past half century. The primary structural technology drivers during Dr. Stein's career included 1940's aluminum aircraft, 1950's jet aircraft, 1960's launch vehicles and advanced spacecraft, 1970's reusable launch vehicles and commercial aircraft, and 1980's composite aircraft. Dr. Stein's research was driven by these areas and he made lasting contributions for each. Dr. Stein's research can be characterized by a judicious mixture of physical insight into the problem, understanding of the basic mechanisms, mathematical modeling of the observed phenomena, and extraordinary analytical and numerical solution methodologies of the resulting mathematical models. This paper summarizes Dr. Stein's life and his contributions to the technical community.
Author
Structural Analysis; Structural Engineering; Structural Stability; Aircraft Structures; Thin Plates; Composite Structures; Aerospace Vehicles

19980019036 NASA Langley Research Center, Hampton, VA USA
Design and Evaluation of Composite Fuselage Panels Subjected to Combined Loading Conditions
Ambur, Damodar R., NASA Langley Research Center, USA; Rouse, Marshall, NASA Langley Research Center, USA; Stability Analysis of Plates and Shells; Jan. 1998, pp. 385-398; In English; Also announced as 19980019011
Report No.(s): AIAA Paper 97-1303; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A04, Microfiche

Methodologies used in industry for designing transport aircraft composite fuselage structures are discussed. Several aspects of the design methodologies are based on assumptions from metallic fuselage technology which requires that full-scale structures be tested with the actual loading conditions to validate the designs. Composite panels which represent crown and side regions of a fuselage structure are designed using this approach and tested in biaxial tension. Descriptions of the state-of-the-art test facilities used for this structural evaluation are presented. These facilities include a pressure-box test machine and a D-box test fixture in a combined loads test machine which are part of a Combined Loads Test System (COLTS). Nonlinear analysis results for a reference shell and a stiffened composite panel tested in the pressure-box test machine with and without damage are presented. The analytical and test results are compared to assess the ability of the pressure-box test machine to simulate a shell stress state with and without damage. A combined loads test machine for testing aircraft primary structures is described. This test machine includes a D-box test fixture to accommodate curved stiffened panels and the design features of this test fixture are presented. Finite element analysis results for a curved panel to be tested in the D-box test fixture are also discussed.
Author
Composite Structures; Curved Panels; Fuselages; Transport Aircraft; Aircraft Design; Damage Assessment; Performance Tests; Structural Analysis; Finite Element Method; Structural Design; Axial Loads

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LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and space biology.

19980018292 Crew Systems Consultants, San Marcos, TX USA
Helmet-Mounted Display Design Guide
Newman, Richard L., Crew Systems Consultants, USA; Greeley, Kevin W., Crew Systems Consultants, USA; Nov. 03, 1997; 406p; In English
Contract(s)/Grant(s): NAS2-14131
Report No.(s): AD-A331767; NASA/CR-97-206824; NAS 1.26:206824; TR-97-11; No Copyright; Avail: CASI; A18, Hardcopy; A04, Microfiche

Helmet Mounted Displays (HMDs) present flight, navigation, and weapon information in the pilot's line of sight. The HMD was developed to allow the pilot to retain aircraft and weapon information while looking off boresight. This document reviews current state of the art in HMDs and presents a design guide for the HMD engineer in identifying several critical HMD issues: symbol stabilization, inadequate definitions, undefined symbol drive laws, helmet considerations, and Field of View (FOV) vs. resolution tradeoff requirements. In particular, display latency is a key issue for HMDs. In addition to requiring further experimental studies, it impacts the definition and control law issues. Symbol stabilization is also critical. In the case of the Apache helicopter, the lack of compensation for pilot head motion creates excessive workload during hovering and Nap of the Earth (NOE) flight. This translates into excessive training requirements. There is no agreed upon set of definitions or descriptions for how HMD symbols are driven to compensate for pilot head motion. A set of definitions is proposed to address this. There are several specific areas where simulation and flight experiments are needed: development of hover and NOE symbologies which compensate for pilot head movement; display latency and sampling, and the tradeoff between FOV, sensor resolution and symbology.
DTIC
Helmet Mounted Displays; Design Analysis; Product Development; Flight Simulation

19980018856 Arizona Univ., Tucson, AZ USA
Immunotoxicology of Exposure to JP-8 Jet Fuel ***Final Report***
Harris, David, Arizona Univ., USA; Dec. 1997; 13p; In English
Contract(s)/Grant(s): F49620-96-I-0075; AF Proj. 2312
Report No.(s): AD-A332846; AFOSR-97-0701TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Chronic jet fuel exposure could be detrimental to Air Force personnel, by not only adversely affecting their work performance but also by predisposing these individuals to increased incidences of infectious disease, cancer and autoimmune dysfunctions. Chronic exposure to jet fuel has been shown to adversely affect human liver function, to cause emotional dysfunction, to cause abnormal electroencephalograms, to cause shortened attention spans, and to decrease sensorimotor speed. Currently, there are no standards for personnel exposure to jet fuels of any kind, let along JP-8 jet fuel. Kerosene based petroleum distillates have been associated with hepatic, renal, neurologic and pulmonary toxicity in animals models and human occupational exposures. The U.S. Department of Labor, Bureau of Labor statistics estimates that over 1.3 million workers were exposed to jet fuels in 1992. Thus, jet fuel exposure may not only have serious consequences for USAF personnel, but also may have potential harmful effects upon a significant number of civilian workers. Short-term (7 day) JP-8 jet fuel exposure causes lung injury as evidenced by increased pulmonary resistance, a decrease in bronchoalveolar lavage concentrations of substance P, increased wet lung/body weight ratio, and increased alveolar permeability. Long-term exposures, although demonstrating evidence of lung recovery, results in injury to secondary organs such as liver, kidneys and spleen.
DTIC
JP-8 Jet Fuel; Jet Engine Fuels; Toxicology; Immunity; Human Performance; Armed Forces (USA)

19980018968 Civil Aeromedical Inst., Oklahoma City, OK USA
Selection of an Internal Standard for Postmortem Ethanol Analysis ***Final Report***
Canfield, Dennis V., Civil Aeromedical Inst., USA; Smith, Moraine D., Civil Aeromedical Inst., USA; Adam, Heather J., Civil Aeromedical Inst., USA; Houston, Eric R., Civil Aeromedical Inst., USA; Feb. 1998; 14p; In English
Report No.(s): DOT/FAA/AM-98/5; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

One mission of the Civil Aeromedical Institute is to determine the concentrations of alcohol in postmortem specimens related to aviation accidents. This requires the ability to identify and quantitate a wide range of alcohols that are produced in postmortem specimens. A headspace gas chromatographic procedure utilizing n-propanol as an internal standard had been used in the past. However, n-propanol has been found in postmortem specimens, making n-propanol an unsuitable specimen for an internal stan-

dard in the analysis of postmortem specimens. This study evaluated 3 potential replacement internal standards for postmortem ethanol analysis. A mixture of alcohols commonly found in postmortem specimens was prepared and tested using headspace gas chromatography. Solutions were prepared using the test mix and the new internal standards. Data were collected on the resolution and reproducibility of the proposed new internal standards with the test mix. Postmortem cases collected over the past 8 years were reviewed for the presence of specific volatile compounds. Baseline resolution from the test mix was not obtained with propionaldehyde, while propionic acid methyl ester exhibited degradation over time. T-butanol was found to give baseline resolution from all volatile compounds commonly found in antimortem and postmortem specimens. No t-butanol was found in 2880 fatal pilots analyzed over the past 8 years for the presence of volatiles. T-butanol is a better internal standard for the analysis of alcohols in postmortem specimens than propionaldehyde, n-propanol, and propionic acid methyl ester, and is not produced in postmortem specimens.
Author
Aircraft Accidents; Alcohols; Ethyl Alcohol; Gas Chromatography; Butanes; Pilots (Personnel)

15
MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

19980018043 Research Inst. for Advanced Computer Science, Moffett Field, CA USA
PLUM: Parallel Load Balancing for Unstructured Adaptive Meshes
Oliker, Leonid, Research Inst. for Advanced Computer Science, USA; Jan. 1998; 124p; In English
Contract(s)/Grant(s): NAS2-96027
Report No.(s): NASA/CR-1998-207075; NAS 1.26:207075; RIACS-TR-98-01; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Dynamic mesh adaption on unstructured grids is a powerful tool for computing large-scale problems that require grid modifications to efficiently resolve solution features. by locally refining and coarsening the mesh to capture physical phenomena of interest, such procedures make standard computational methods more cost effective. Unfortunately, an efficient parallel implementation of these adaptive methods is rather difficult to achieve, primarily due to the load imbalance created by the dynamically-changing nonuniform grid. This requires significant communication at runtime, leading to idle processors and adversely affecting the total execution time. Nonetheless, it is generally thought that unstructured adaptive- grid techniques will constitute a significant fraction of future high-performance supercomputing. Various dynamic load balancing methods have been reported to date; however, most of them either lack a global view of loads across processors or do not apply their techniques to realistic large-scale applications.
Author
Unstructured Grids (Mathematics); Dynamic Loads; Parallel Programming; Aerodynamic Drag; Simulation

19980018950 Odyssey Research Associates, Inc., Ithaca, NY USA
Formal Specification of a Flight Guidance System *Final Report*
Fung, Francis, Odyssey Research Associates, Inc., USA; Jamsek, Damir, Odyssey Research Associates, Inc., USA; Jan. 1998; 100p; In English
Contract(s)/Grant(s): NAS1-20335; RTOP 519-30-31-01
Report No.(s): NASA/CR-1998-206915; NAS 1.26:206915; TR-97-0042; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

In this report, we investigate the use of formal methods on the semi-formal specification of a Flight Guidance System described in Steven P. Miller and Karl F. Hoech's "Specifying the Mode Logic of a Flight Guidance System in CoRE." The CoRE method can be used with the formal semantics of the SCR discrete-time formal model. However, Miller and Hoech's specification does not satisfy the restrictions of this formal model; for instance, they use concurrent mode machines that drive each other. Furthermore, Miller and Hoech add several notions to CoRE in their specification, without formal definitions. We use the Z notation to give a formal semantics for the Flight Guidance System, by adapting the SCR formal model's definitions of event and transitions, which mesh well with Z conventions. In particular, we do not define any micro-time semantics. We give formal definitions for Miller and Hoech's extensions to CoRE, expect for the "continuous transition to FLC," which seems to be best

expressed using micro-time semantics. We perform experiments of formal verification on the specification using Z/EVES. In restricted versions of the specification, we are able to do table consistency checking and to verify properties such as determinism and system invariants.
Author
Flight Control; Computer Programming; Programming Languages

19980018992 NASA Langley Research Center, Hampton, VA USA
A Preconditioning Method for Shape Optimization Governed by the Euler Equations ***Final Report***
Arian, Eyal, Institute for Computer Applications in Science and Engineering, USA; Vatsa, Veer N., NASA Langley Research Center, USA; Feb. 1998; 18p; In English
Contract(s)/Grant(s): NAS1-19480; RTOP 505-90-52-01
Report No.(s): NASA/CR-1998-206926; NAS 1.26:206926; ICASE-98-14; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We consider a classical aerodynamic shape optimization problem subject to the compressible Euler flow equations. The gradient of the cost functional with respect to the shape variables is derived with the adjoint method at the continuous level. The Hessian (second order derivative of the cost functional with respect to the shape variables) is approximated also at the continuous level, as first introduced by Arian and Ta'asan (1996). The approximation of the Hessian is used to approximate the Newton step which is essential to accelerate the numerical solution of the optimization problem. The design space is discretized in the maximum dimension, i.e., the location of each point on the intersection of the computational mesh with the airfoil is taken to be an independent design variable. We give numerical examples for 86 design variables in two different flow speeds and achieve an order of magnitude reduction in the cost functional at a computational effort of a full solution of the analysis partial differential equation (PDE).
Author
Preconditioning; Compressible Flow; Airfoils; Computational Fluid Dynamics; Discretization (Mathematics); Optimization

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PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.

19980018855 Arizona Univ., Dept. of Mathematics, Tucson, AZ USA
Communications through Plasma Sheaths: Alternative Approaches Using Nonlinear Properties of the Plasma ***Final Report, 1 Jul. 1996 - 31 Jul. 1997***
Newell, A. C., Arizona Univ., USA; Zakharov, V. E., Arizona Univ., USA; Nov. 11, 1997; 3p; In English
Contract(s)/Grant(s): F49620-93-I-0058
Report No.(s): AD-A332688; AFOSR-TR-97-0625; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We developed useful results in connection with the use of nonlinear plasma properties to enhance communication properties and improve drag reduction and flight characteristics of hypersonic vehicles. Over the past three years, we carried out a detailed Investigation of the relevant plasma processes, such as Raman and Brillouin scattering, Ion-acoustic pluses and fast electrons. The objective of this work was to find under what parameters of plasma and microwave these processes could be effective for transmitting a message written on the signal wave to the vehicle through the plasma sheath.
DTIC
Plasmas (Physics); Brillouin Effect; Nonlinearity; Flight Characteristics; Drag Reduction

19980018958 NASA Lewis Research Center, Cleveland, OH USA
Noise from Supersonic Coaxial Jets, Part 2, Normal Velocity Profile
Dahl, M. D., NASA Lewis Research Center, USA; Morris, P. J., Pennsylvania State Univ., USA; Journal of Sound and Vibration; 1997; ISSN 0022-460X; Volume 200, No. 5, pp. 665-699; In English
Contract(s)/Grant(s): RTOP-505-62-52
Report No.(s): NASA/CR-97-207389; E-10955; NAS 1.26:207389; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

Instability waves have been established as noise generators in supersonic jets. Recent analysis of these slowly diverging jets has shown that these instability waves radiate noise to the far field when the waves have components with phase velocities that are supersonic relative to the ambient speed of sound. This instability wave noise generation model has been applied to supersonic jets with a single shear layer and is now applied to supersonic coaxial jets with two initial shear layers. In this paper the case of coaxial jets with normal velocity profiles is considered, where the inner jet stream velocity is higher than the outer jet stream velocity. to provide mean flow profiles at all axial locations, a numerical scheme is used to calculate the mean flow properties. Calculations are made for the stability characteristics in the coaxial jet shear layers and the noise radiated from the instability waves for different operating conditions with the same total thrust, mass flow and exit area as a single reference jet. The effects of changes in the velocity ratio, the density ratio and the area ratio are each considered independently.
Author
Velocity Distribution; Supersonic Jet Flow; Noise Generators; Aircraft Noise; Noise Pollution; Noise Reduction; Numerical Analysis

17
SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law, political science, and space policy; and urban technology and transportation.

19980018495 General Accounting Office, National Security and International Affairs Div., Washington, DC USA
Report to Congressional Committees. Public-Private Competitions: Processes Used for C-5 Aircraft Award Appear Reasonable
Jan. 1998; 46p; In English
Report No.(s): B-278991; GAO/NSIAD-98-72; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Our assessment of the issues required under the 1998 Defense Authorization Act relating to the C-5 aircraft competition concluded that (1) the C-5 competition procedures provided an equal opportunity for public and private offerors to compete without regard to where work could be performed; (2) the procedures did not appear to deviate in any material respect from the applicable laws or the FAR; and (3) based on Air Force assumptions and conditions at the time of award, the award resulted in the lowest total cost to the government. A discussion of these conclusions follows, with a detailed description and assessment of the competition in appendix 3.
Author
Congressional Reports; C-5 Aircraft; Competition; Costs

19980018504 Vrije Univ., Amsterdam, Netherlands
Simulating the Effect of Airline Deregulation on Frequency Choice: A Model of Spatial Product Proliferation
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The aim of this paper is to compare properties of equilibria in airline markets for a few extreme economic regimes, which are intended to approximate different types of regulation. Two important variables of interest are fare and especially frequency. The problem of frequency and fare determination in (air) transport markets is not new, nor is the basic spatial model used in this paper. Relevant articles using such a model include Panzar, Greenhut et al. and Evans. The former two study equilibria in airline markets before and after deregulation, the latter compares equilibria for different economic regimes in the bus industry. This paper addresses the problem of frequency and fare choice by modifying the standard spatial model in two ways. Firstly, we modify the mechanism which determines frequency. Usually, frequency in the spatial model is derived from the zero profit condition, that is, each airline offers one flight and airlines enter the market until profit for each departure is zero. In the present model, this mechanism is replaced by the assumption that there is no entry, while a fixed number of airlines decides non-cooperatively how many flights to schedule. This is modeled as a two stage game, in which each airline takes a symmetric price equilibrium in stage 2 into account when deciding on frequency in stage one. This approach is similar to the non-spatial model of product proliferation by Raubitschek. The second modification is the introduction of aircraft capacity constraints. This constraint and the restriction that

there is only one aircraft type allows us to compare frequency changes for markets of varying demand density. The paper is organized as follows: in section 2, the general spatial model is reviewed. The next section presents the three economic or regulatory regimes, and the nature of the equilibria in each of them. Section 4 introduces the specific demand structure, capacity constraints and derives the equilibrium conditions for the model, while section 5 presents numerical simulation results for the main variables. Derived from text

Airline Operations; Simulation; Commercial Aircraft; Market Research; Selection; Civil Aviation; Air Transportation

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